

SEPTEMBER 1957—SIXTY-FOURTH YEAR

# Machinery



## Helixform\* — a new method for bevel gear production!

The new No. 112 Hypoid Helixform Gear Finisher assures improved quality and increased production on spiral bevel and hypoid non-generated ring gears up to 10½" in diameter, and 2½ DP such as employed in passenger car axles.

The Helixform Cutting Method used on this machine offers these advantages:

Conjugate tooth surfaces, minimized gear development, complete control of tooth bearing, and greater adjustability in final assembly.

Our literature on the No. 112 Hypoid Helixform Gear Finisher and the companion No. 112 Hypoid Gear Rougher is yours for the asking. Write for it today.



### GLEASON WORKS

Builders of bevel gear machinery for over 90 years  
1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

\*Trade-Mark

# NEW CAM OPERATED BORE-MATIC

provides

## wide capacity range

for small to medium work



Heald Model 2215  
Cam Operated Bore-Matic

|                            |             |
|----------------------------|-------------|
| Table Stroke.....          | 9"          |
| Boring Stroke.....         | 5"          |
| Table Pad.....             | 18" x 41"   |
| Cross-Slide Stroke.....    | 4"          |
| Cross-Slide Table Pad..... | 13½" x 22½" |

Entire cam unit and drive swings out on hinged panel for easy access. Locating pads on panel and base assure positive location of cams at all times. Wipers clean cam surfaces just prior to contact point of cam and follower at which point continuous lubrication is applied.



THIS new addition to the Heald line is designed for continuous, high-production Borizing of work where cam type operation and control are desirable. Table and cross-slide feeds are controlled by separate cams located in the machine base, each cam being so contoured as to provide the desired cycle. The cross-slide cam can also be arranged to operate cross-feed units or feed-out quills. By appropriate design of table and cross-feed cams, any combination of straight, taper or contour boring, turning, facing or grooving operations can be performed. For complete information, send for a copy of Bulletin 2-2215.

**IT PAYS TO COME TO HEALD!**

**THE HEALD MACHINE COMPANY**

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York



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Published monthly by  
**THE INDUSTRIAL PRESS**  
 ROBERT B. LUCHARS *President*  
 EDGAR A. BECKER *Vice-President and Treasurer*  
 HAROLD L. GRAY *Secretary and Publishing Manager*  
 Editorial, Advertising, and  
 Circulation Offices:  
 93 Worth St., New York 13, N. Y.  
 Telephone, CANal 6-8120

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 1201 Forest View Lane, Birmingham 9, Ala.

Subscription rates: United States and Canada, one year, \$4; two years, \$7; three years, \$8; foreign countries, one year, \$7; two years, \$13. Single copies, 50 cents. Changes in address must be received by the tenth of the month to be effective for the next issue. Send old as well as new address. Copyright 1957 by The Industrial Press.

Entered as second-class mail matter May 25, 1953, at the Post Office at Bristol, Conn., under the Act of March 3, 1879. Printed by Hildreth Press, Inc., Bristol, Conn., U.S.A.

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# Machinery

SEPTEMBER 1957 VOL. 64 NO. 1

THE MONTHLY MAGAZINE OF ENGINEERING AND PRODUCTION  
 IN THE MANUFACTURE OF METAL PRODUCTS

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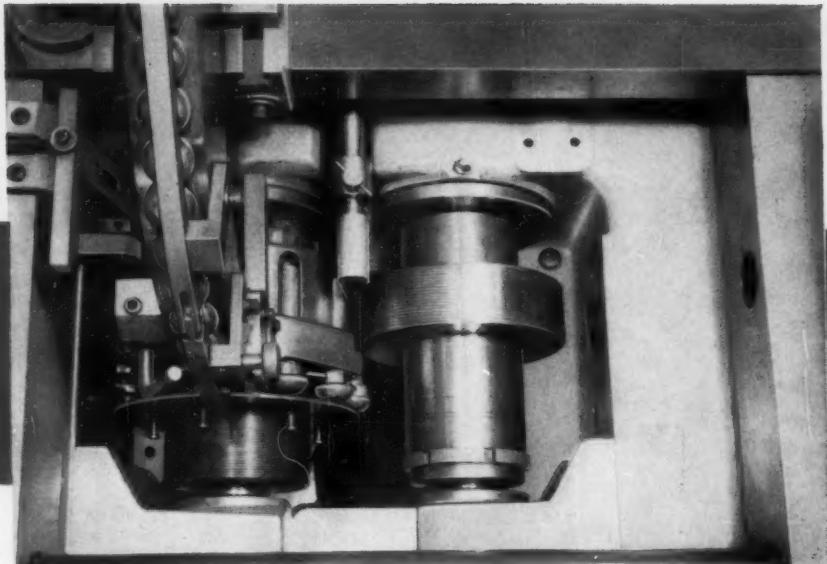
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# AUTOMATED THREAD ROLLING

*with the LANHYROL machine*





The automatic features of the LANHYROL Thread Rolling Machine have enabled a large industrial fastener and related parts company to automate its process for producing button head oval neck track bolts.  $\frac{3}{4}$ " 10 pitch UNC threads are rolled  $1\frac{3}{4}$ " in length to Class 2A fit.

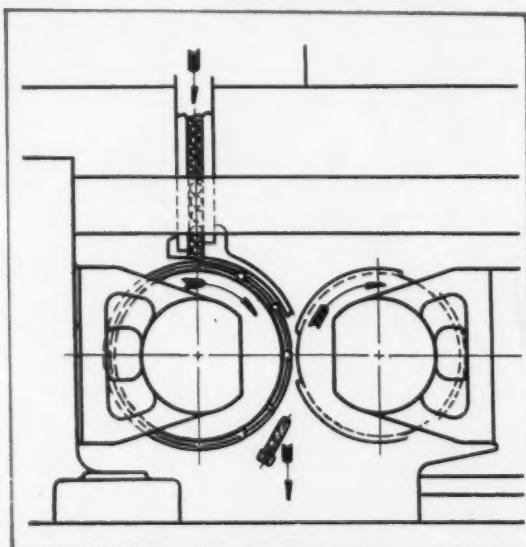
**One man now handles the entire operation,** eliminating difficult and costly handling of hot-forged bolt blanks required in the old process. Now . . . bolt blanks are cold-formed from

800-lb. coils of hot-rolled steel wire by passing through a wire-drawer into a two-blow header, conveyed to a hopper, threaded by Continuous Rolling on the LANHYROL Machine, and ejected as finished parts into a bin for removal.

Continuous Rolling (illustrated) is one of three thread-rolling methods utilized by the LANHYROL Machine. Blanks are delivered from a hopper to an automatic, indexing-type workrest. This indexes the pieces according to a preset cycle into and away from the rolling position. There, thread-rolling is accomplished by two opposed cam-type rolling dies.

Although the LANHYROL is capable of rolling 80 track bolts per minute, in this application it is only operated to slightly exceed the production rate of the header which is 60 blanks per minute. Thread finish is considerably improved over previous methods and roll life is excellent . . . more than  $\frac{3}{4}$  of a million bolts have been threaded to date with the original roll dies.

The LANHYROL Machine produces excellent threads at unequalled rates of output, and its method of operation fits well into automated processes. For information on its unusual range and flexibility, and the Infeed and Thru-feed thread rolling methods, send specifications and ask for Bulletin E-60.

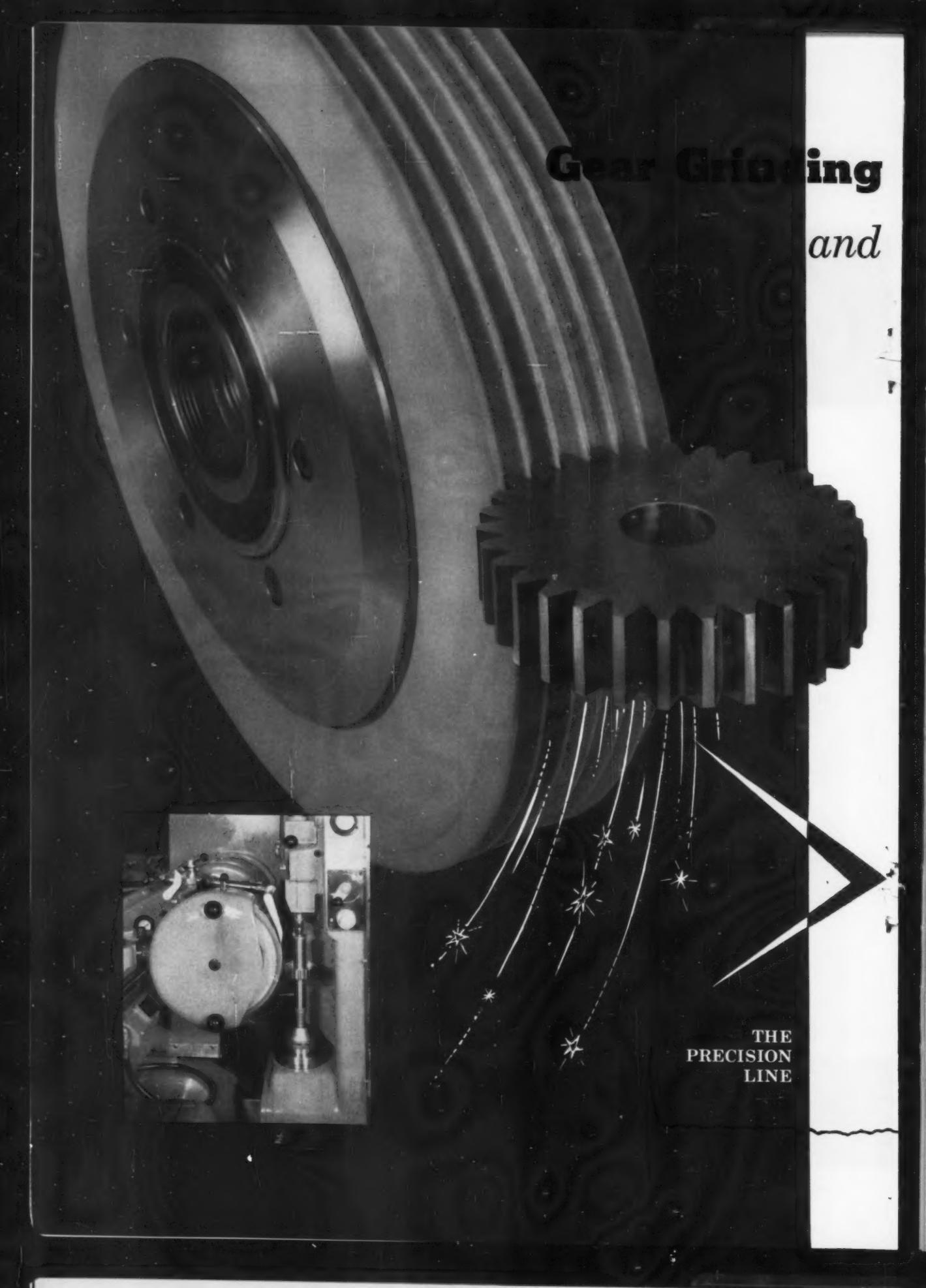


# LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.

For more information fill in page number on Inquiry Card, on page 255

MACHINERY, September, 1957—3



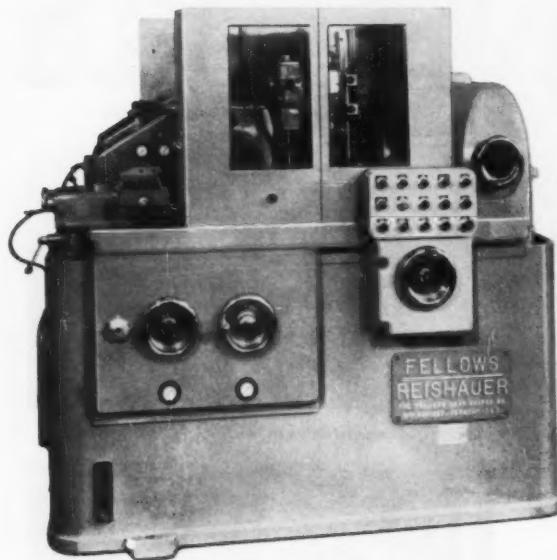
# Gear Grinding and

THE  
PRECISION  
LINE

# Accuracy

# Production Speed . . .

*a cost saving combination.*



## FELLOWS-REISHAUER Gear Grinding Machine

*American-made by Fellows*

Under license from the Reishauer Tool Works Ltd., Zurich, Switzerland, Fellows now manufactures the precision No. 12 Fellows-Reishauer Gear Grinding Machine.

An emery wheel, on which a helix has been developed, generates the gear tooth shape. The tooth section of the wheel is usually that of the basic involute rack. As the wheel turns in harmony with the work while the work passes axially by the wheel, an involute is generated.

Grinding is done in both directions of travel of the work-slide. Simple, fast machine set-up permits the economical grinding of single piece lots as well as the long production runs.

For grinding spur and helical gears up to 12" O.D. and 6 $\frac{3}{4}$ " face width, the American-made Fellows-Reishauer is outstanding for combined speed and accuracy. Ask your Fellows representative about it.

THE FELLOWS GEAR SHAPER COMPANY  
78 River Street, Springfield, Vermont

Branch Offices:

1048 North Woodward Ave., Royal Oak, Mich.  
150 West Pleasant Ave., Maywood, N.J.  
5835 West North Avenue, Chicago 39  
6214 West Manchester Ave., Los Angeles 45

# Fellows

Gear Production Equipment

## Dial Type Operating

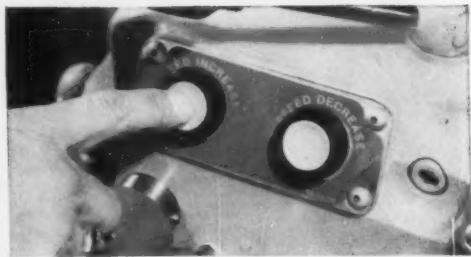
help the operator improve  
his performance



Identification disks  
on all control levers

### Brief Specs. Dial Type Milling Machines

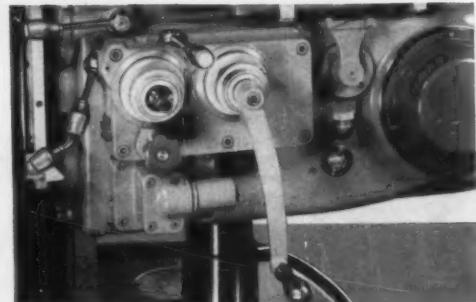
| DIAL TYPE LINE |                                | table<br>traverse | main<br>drive | automatic<br>table cycles<br>available |
|----------------|--------------------------------|-------------------|---------------|--|
| No. 2          | Plain<br>Universal<br>Vertical | 28"               | 10 hp         | yes<br>no<br>yes                       |
| No. 3          | Plain<br>Universal<br>Vertical | 34"               | 15 hp         | yes<br>no<br>yes                       |
| No. 4          | Plain<br>Universal<br>Vertical | 42"               | 20 hp         | yes<br>no<br>yes                       |



Push-button selection of spindle speeds



Power selection of feeds,  $\frac{1}{8}$  to 90 ipm



Rear operating controls are duplicates of those located at  
the front of the machine. (Plain and Universal styles)



# CINCINNATI

MILLING MACHINES • BROACHING MACHINES • CUTTER AND TOOL GRINDERS • SPECIAL MACHINE

## Conveniences



Ask the man at the machine. He'll tell you that built-in operating conveniences have a direct tie-in with costs. For example, consider a much appreciated Dial Type convenience like identification disks on control knobs. They jog the operator's memory; help him avoid wrecks between the cutter and work or fixture. Other CINCINNATI® Dial Type operating conveniences include:

**Push-button selection of spindle speeds:** in increasing or decreasing steps

**Power feed change:** in increasing or decreasing steps

**Independent, directional controls:** with palm-fitting plastic knobs

**Dynapoise chatter-damping overarm:** greatly reduces the noise of cutting action  
**Safe to operate:** all hand cranks automatically disengaged when power feed or rapid traverse is engaged

**Complete rear controls (Plain and Universal machines)**

These are but a few reasons why Dial Type Milling Machines are tops with the operator. Want more information? Look in Sweet's Machine Tool File for brief specifications; complete data in catalog No. M-1915-2.

**THE CINCINNATI MILLING MACHINE CO.  
CINCINNATI 9, OHIO**

**TOOLS • METAL FORMING MACHINES • HARDENING MACHINES • CUTTING FLUID • GRINDING WHEELS**

For more information fill in page number on Inquiry Card, on page 255

MACHINERY, September, 1957—7

Now you can get

Horizontal,

## PLUS Boring and Drilling

All from one machine **WHEN** it's a

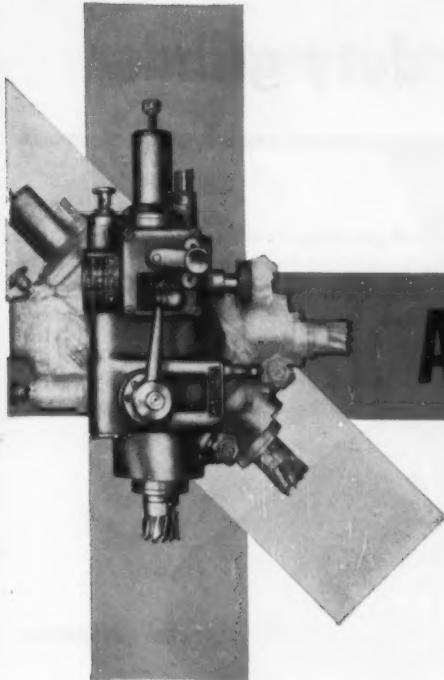
You make one investment in one machine . . . and when it's a Van Norman No. 16S, with quill type-adjustable cutterhead, you've got the most versatile machine available.

This quill type cutterhead is mounted on a rugged, heavy-duty movable ram that increases the scope of operations . . . permits maximum cuts. The 16S reduces overall completion time . . . offers numerous opportunities to cut costs, increase production.

Get complete details on the versatile Van Norman 16S today. Write, wire or telephone for catalog.

### VAN NORMAN MACHINE

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

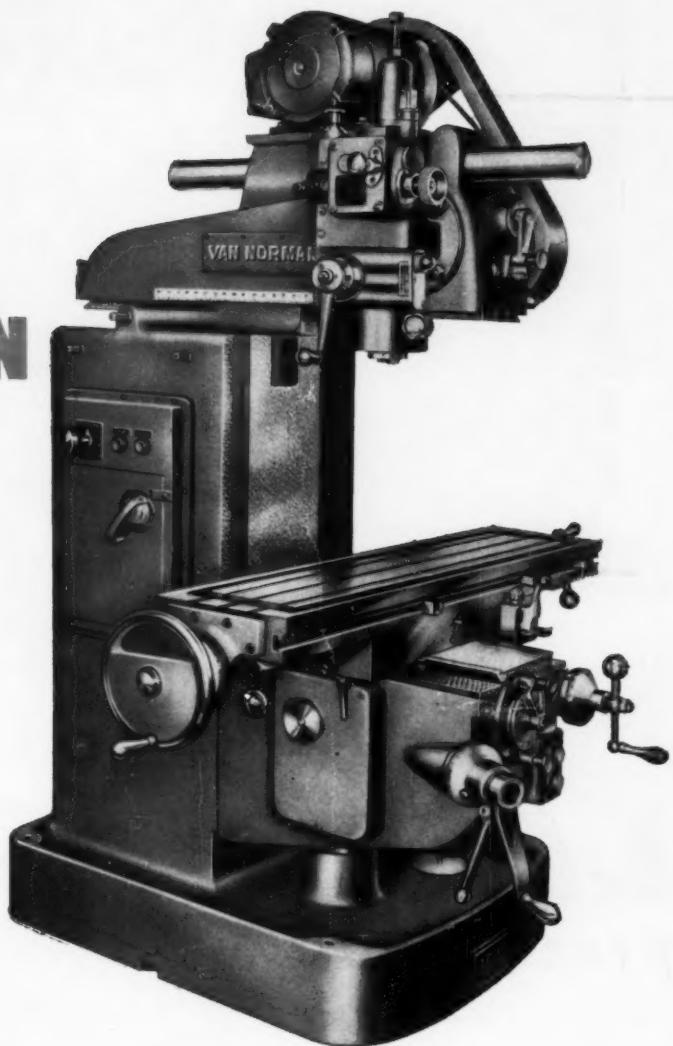


## Angular, Vertical Milling

# VAN NORMAN no. 16S

Don't wait . . . for extra profit install a Van Norman machine now! They are available on several purchase plans . . . Outright sale . . . On conditional sales contract up to five years . . . Pay as you depreciate up to 10 years.

Conditional Sales Contracts not available to Export.



**COMPANY**

**SPRINGFIELD 7,  
MASSACHUSETTS**

For more information fill in page number on Inquiry Card, on page 255

MACHINERY, September, 1957—9

# New Landis wide wheel heavy duty grinder

... on these jobs

1. Profile grinding
2. Wide wheel infeed grinding... makes one operation of jobs formerly requiring two or more
3. Spaced wheels infeed grinding... finishes several diameters at one time



Landis 10" x 18" Type DCH Plain Hydraulic Grinder  
Standard Wheel Sizes: 24"x10", 30"x9", 36"x5"

# LANDIS

precision grinders

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

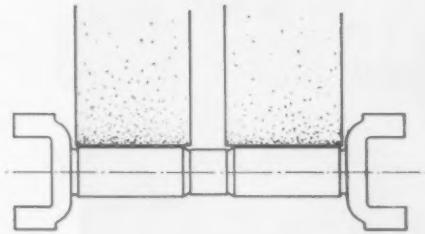
Landis type DCH plain grinder design features  
Heavy duty wheel spindle and microsphere bearings  
20 hp wheel drive motor  
10" or 14" machine swing  
1½ hp work drive motor

# **combines operations, lowers costs**

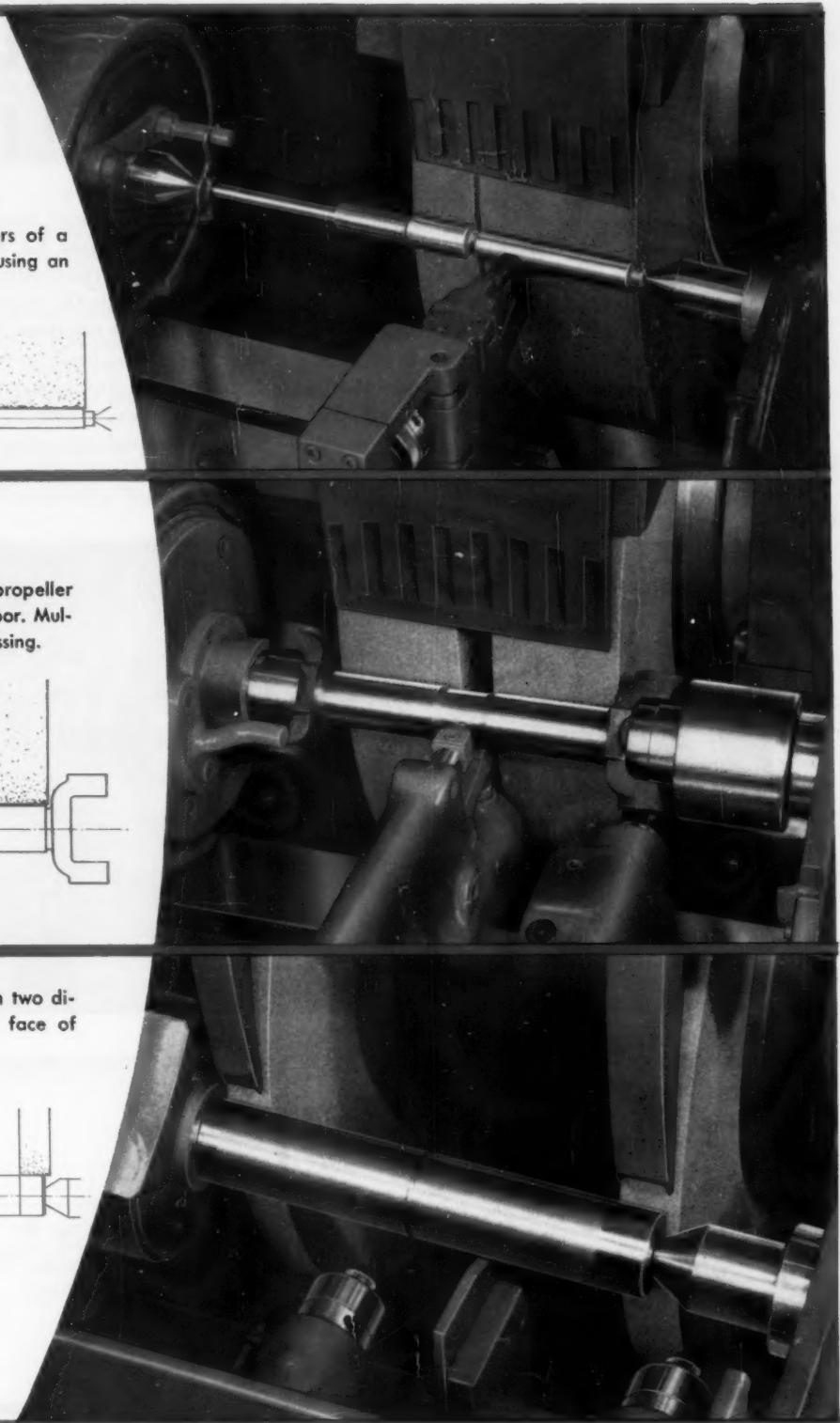
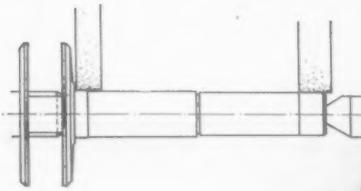
**Profile** grinding two diameters of a motor shaft in one operation using an 8" wide wheel.



**Infeed** grinding diameters of propeller shaft sleeve yokes on one arbor. Multiple table-type diamond dressing.



**Widely spaced wheels** finish two diameters and one adjoining face of transmission output shaft.



# INCREASE PROFIT MARGIN ON FORMED STAMPINGS WITH U.S. MULTI-SLIDES®

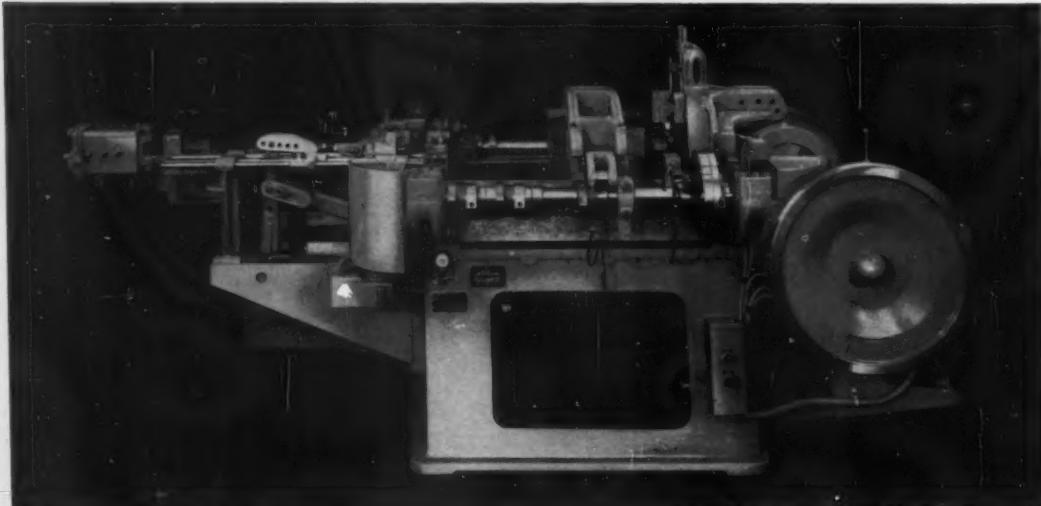
Reduce your costs and increase your profit potential! The elimination of secondary operations and handlings is one of the best ways in which you can achieve reduced costs. It is therefore important to produce parts, wherever possible, complete in one machine.

The U. S. Multi-Slide, through a combination of built-in motions, allows for the designing of tools to fabricate precision formed metal stampings without secondary handlings.

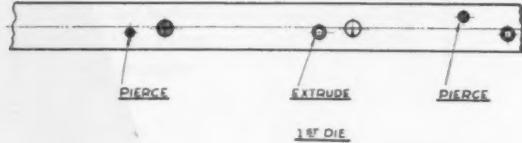
For example, the automotive component shown

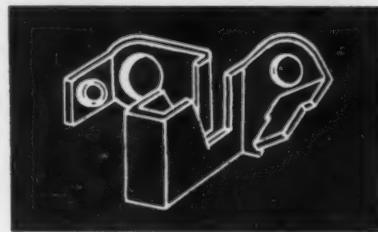
above is produced complete, without secondary operations, in the No. 33 U. S. Multi-Slide Machine of the type illustrated below. The drawings below indicate the sequence of stages in the dies and forming positions. Note the two-level forming position used to complete the piece after cutting off. This automotive part is but one of the many types of formed metal stampings which can be produced complete in the U. S. Multi-Slide.

Standard equipment on the Multi-Slide in-



Above: The No. 33 U. S. Multi-Slide used, with two rams and appropriate tooling, to produce the formed stamping illustrated on the facing page. This size machine has a capacity for material up to 2 1/2" wide by 3/32" thick, with feed length adjustable up to 12 1/2".





cludes: ram action for cutting, piercing, trimming, embossing, etc.; a four-slide forming position, and a vertical movement for stripping and transferring. Since these movements are an integral part of the machine equipment, it is not necessary to incorporate complicated movements into the dies themselves. These features make the U. S. Multi-Slide extremely versatile in the automatic, high-speed production of all types of formed metal stampings.

Investigate! Ask for a copy of Bulletin 15-M, or send us part drawings or samples for our recommendations.

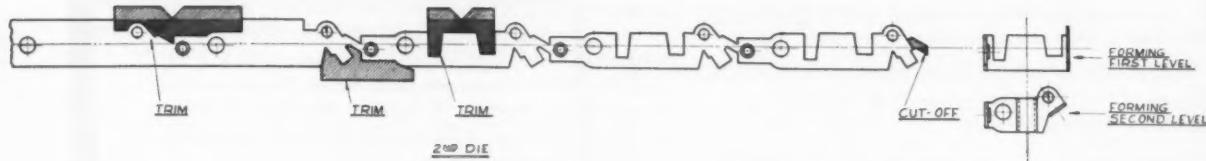
# U. S. TOOL COMPANY, INC.

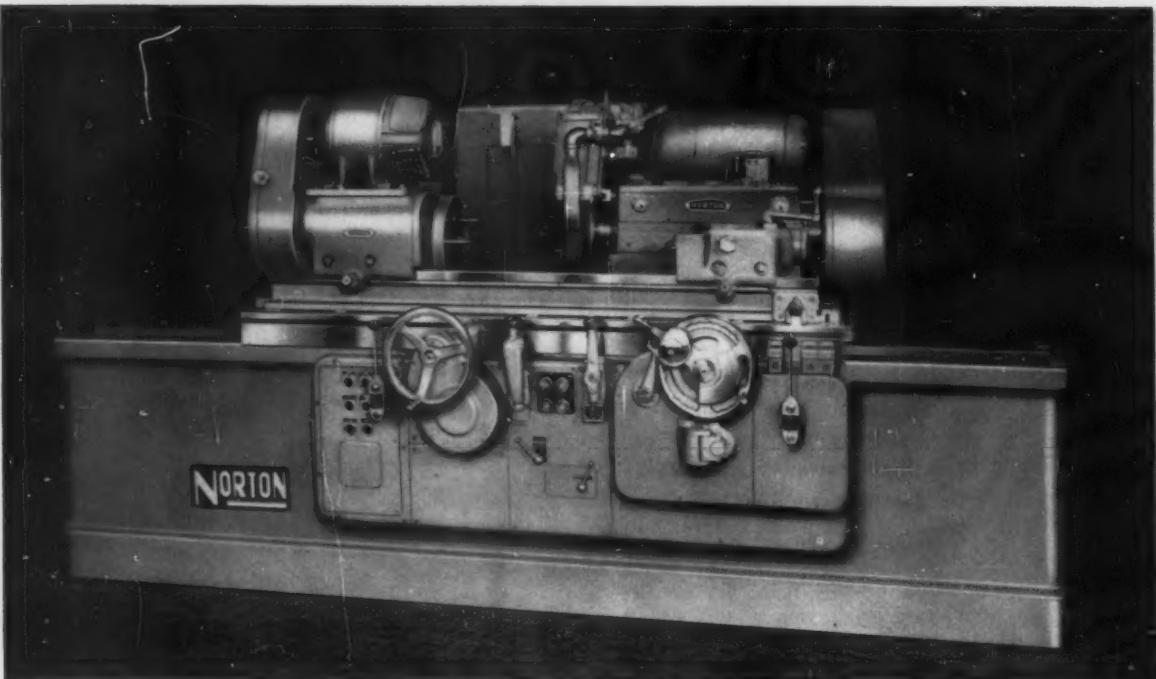
Ampere (East Orange) N. J.

Builders of U. S. Multi-Slides—U. S. Multi-Millers—U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories.

## SEQUENCE STRIP SHOWS OPERATIONS PERFORMED

The drawing below shows the sequence of stages in the dies and forming positions of the U. S. Multi-Slide to produce the automotive component illustrated above. Observe the two-level forming position used to complete the piece after cutting off.





A NORTON TYPE CTU SEMIAUTOMATIC CYLINDRICAL GRINDER. The fastest, most economical and versatile grinding machine of its type. One-lever control of the automatic grinding cycle reduces the operator's duties to loading and unloading. Both the 6" and 10" Type CTU's are available as semiautomatics or as plain machines.

## Norton Type CTU Cylindrical Grinders

are packed with  
features for...

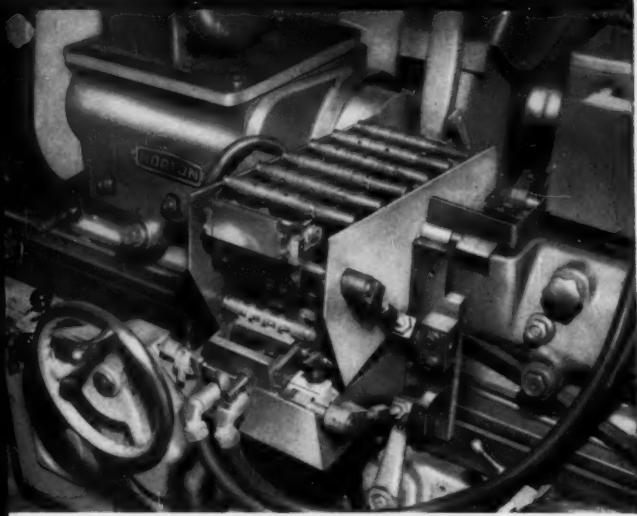


Production line and job shop users report that Norton 6" and 10" Type CTU cylindrical grinders have doubled and tripled production, replaced several machines and eliminated costly extra operations.

That's because of the many time-and-work-saving "Touch of Gold" features — standard and auxiliary — available with these grinders.

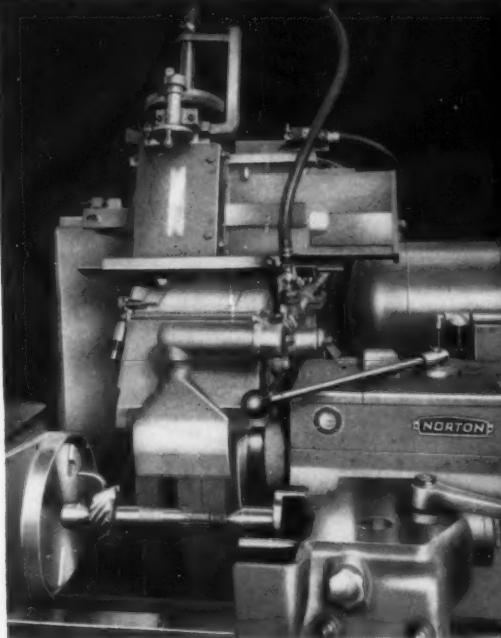
Some of the expertly automated auxiliary features are

described here. Check them carefully — and figure their value to your own cylindrical grinding operations. And remember: only Norton offers you such long experience in both grinding machines and wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. For further facts, see your Norton Representative, or write to NORTON COMPANY, Machine Division, Worcester 6, Mass. In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5.

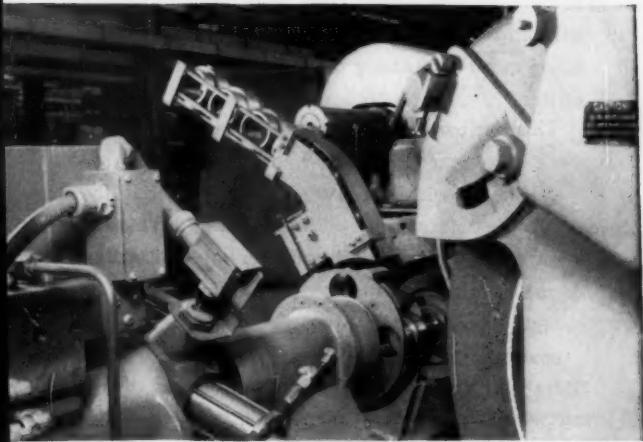


**RAIL TYPE**

**THE SWIVALIGN\* ELIMINATES CUT-AND-TRY.** Another Norton "Touch of Gold" development for faster, better, lower cost grinding. The SWIVALIGN Dual Electric Indicator, available for Norton cylindrical and universal grinders, enables operators to adjust the angular positions of swivel tables quickly and accurately, eliminating the usual cut-and-try guesswork. Featuring positive response and easy operation, this accurate instrument saves grinding time and money.



**WHEEL HEAD MOUNTED AUTOMATIC TRUING OFFERS BIG ADVANTAGES.** A Norton automatic truing device, as shown here on a Type CTU grinder, quickly repays its original cost. It speeds up production, increases wheel life and increases diamond life. Also, it decreases the skill and effort required with hand truing. Operation is extremely simple. Once the original settings are made, all you do is push a button. Then the diamond automatically makes its round trip across the wheel face, at pre-determined speed and feed. Easy adjustments assure correct settings for each job . . . Another step forward in automatic grinding!



**TURRET TYPE**

**YOUR CHOICE OF AUTOMATIC LOADING DEVICES.** Two types of Norton automatic loading devices are obtainable with 6" and 10" Type CTU semiautomatic grinders. The rail type loader is designed to handle a variety of small shafts. The turret type loader handles workpieces which must be chucked. Thanks to their steadily paced, automatic operation these Norton-developed loading mechanisms can be adapted to full automation. Or, they make it possible for one operator to tend a battery of machines, speeding production and cutting unit costs day after day.

**NORTON**  
GRINDERS and LAPPERS

*Making better products...to make your products better*

District Offices: Worcester • Hartford • New York Area,  
Teterboro, New Jersey • Cleveland • Chicago • Detroit

\*SWIVALIGN — Norton trade name for Dual Electric Indicator for accurate measurements of swivel table adjustment.

# Cincinnati Automatic

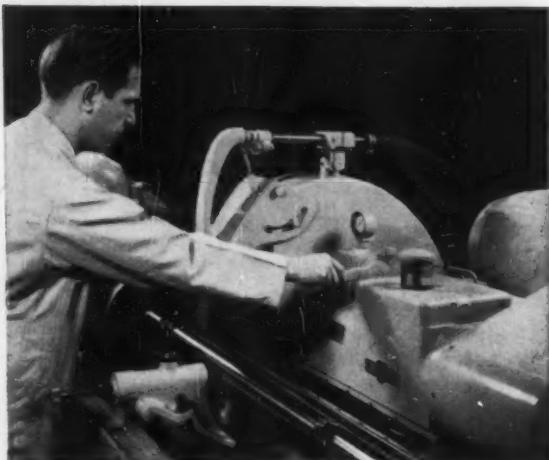
## Improves the Entire

Have you ever seen an operator balance a grinding wheel mount on conventional static balancing ways? It's a tedious operation, and may require 90 minutes or more to remove the wheel mount, balance and replace it. Cincinnati decided to do something about this. They developed automatic grinding wheel balancing . . . it does the job ten times more accurately and infinitely quicker and easier.

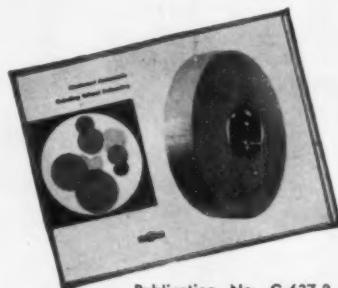
This exclusive Cincinnati feature automatically balances the grinding wheel mount on the machine . . . within a few seconds . . . while the spindle rotates at its operating speed. This exclusive Cincinnati feature eliminates vibration and resultant chatter on the work . . . permits more effective stock removal . . . reduces wheel cost per workpiece.

FILMATIC spindle bearings and automatic grinding wheel balancing constitute a team that just can't be beat for low-cost precision cylindrical grinding. Best of all, these features are standard equipment on CINCINNATI® FILMATIC 6"R, 10"L, 10"R, 14"L, 14" and 16" Plain Grinders, and on 6"R, 10"L, 10"R and 14"L Angular Wheel Slide Grinding Machines. Write today for the complete balancing story. Ask for publication No. G-637-2.

**CINCINNATI GRINDERS INCORPORATED**  
**CINCINNATI 9, OHIO**



In the illustration above the operator shows how easy it is to balance the grinding wheel on a CINCINNATI FILMATIC 10"R x 72" Plain Hydraulic Grinder.



Publication No. G-637-2 explains the Cincinnati Automatic Balancing principle. Write for a copy.

# CINCINNATI

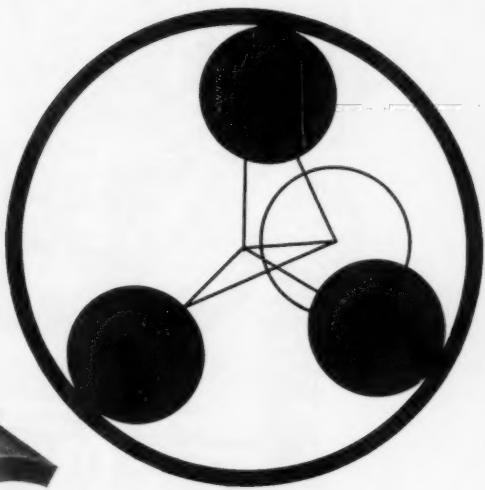


# Wheel Balancing

## Grinding Operation



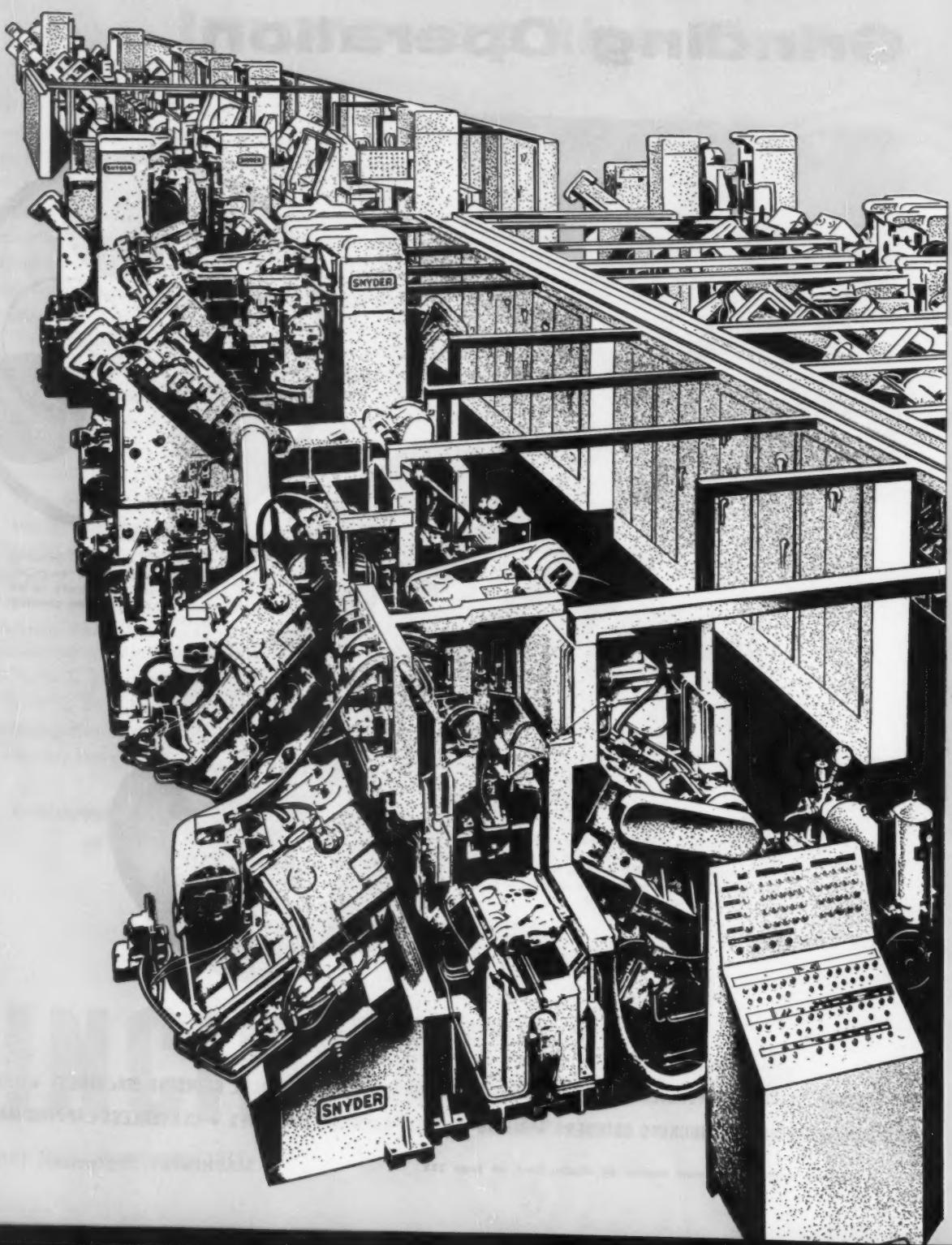
Automatic Grinding Wheel Balancing and FILMATIC Spindle Bearings are exclusive Cincinnati features . . . they just can't be beat for producing the finest finish at the lowest cost on your precision ground work.



Symbol of Automatic Grinding Wheel Balancing . . . the greatest timesaving feature to be found on any precision grinding machine.

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES • CHUCKING GRINDERS • MICRO-CENTRIC GRINDING MACHINES • CENTERLESS LAPING MACHINES

# **Unique Combination of Snyder Special Two or Four Barrel Intake Manifold**

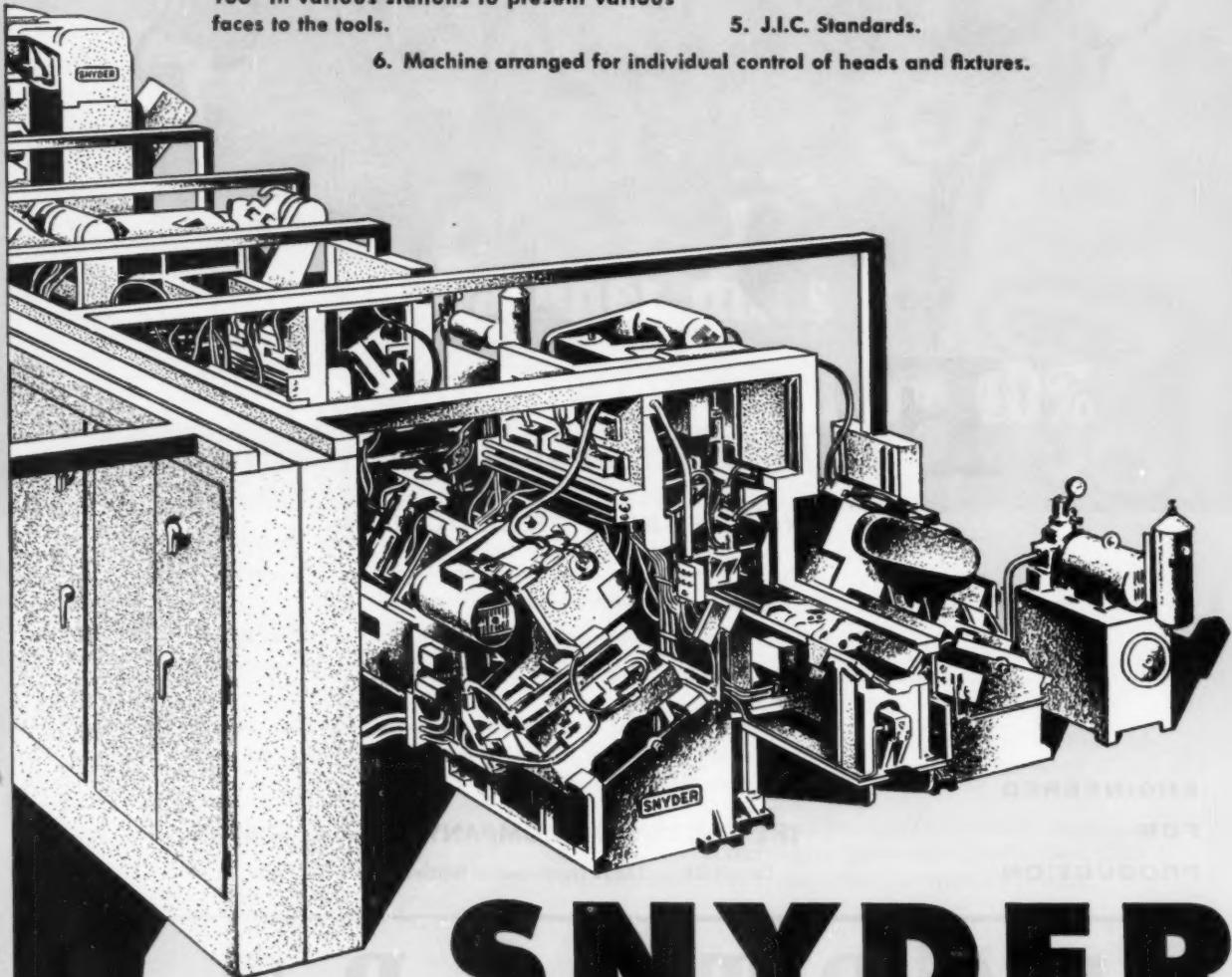


# Transfer Machines Processes Either Castings from Rough to Finished Parts

Combination of two special transfer milling machines in parallel, with automation, feeding into one special transfer drilling machine gives production of 136 pieces per hour

## Special Features of Snyder Machines Nos. 55-60 and 55-61

1. Machine line handles two or four barrel manifolds, random intermixed; sensing devices automatically instruct the proper drilling and tapping units.
2. Part rotated vertically 180° and horizontally 180° in various stations to present various faces to the tools.
3. Individual electrical panels and hydraulic units for each segment.
4. Wing bases, sections, spacers and risers standard throughout for easy adaptation to future part changes.
5. J.I.C. Standards.
6. Machine arranged for individual control of heads and fixtures.

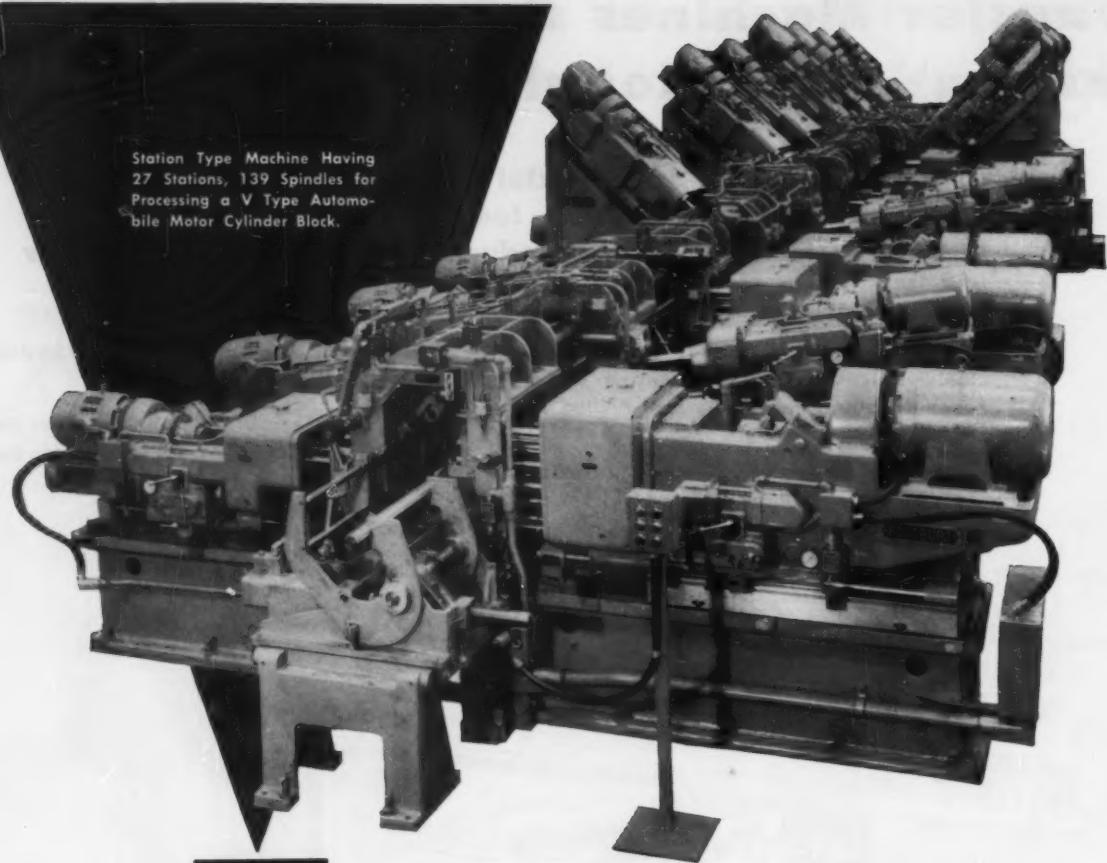


# SNYDER

TOOL & ENGINEERING COMPANY  
3400 E. LAFAYETTE • DETROIT 7, MICHIGAN

32 Years of Special Machine Tools with Automation

Station Type Machine Having  
27 Stations, 139 Spindles for  
Processing a V Type Automobile Motor Cylinder Block.



## FOOTBURT station type machines

### PROGRESSIVE PRODUCTION . . .

With the Station Type Machine, Footburt continues to provide the most modern developments in production machinery.

Drilling, reaming, tapping, milling, checking and testing may be combined in one station type machine, and units may be mounted at any angle.

Installations of Footburt Station Type Machines have been made in many leading automotive plants, in some case handling the major machining on the block and head components.

ENGINEERED  
FOR  
PRODUCTION

THE FOOTE-BURT COMPANY, Cleveland 8, Ohio

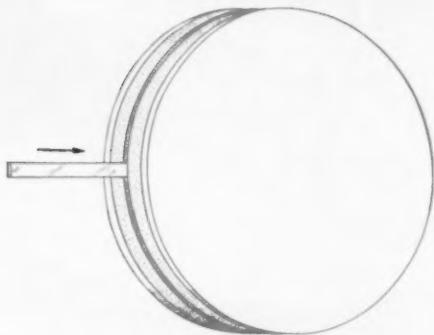
Detroit Office: 24632 Northwestern Highway, Detroit 35, Mich.

**FOOTBURT**  
MACHINE TOOLS



# **Change to Gardner discs increases metal removal by 40%**

**...gives longer disc life and lowers grinding costs**



Workpiece: . . . Bar stock— $\frac{1}{4}$ " to  $1\frac{1}{4}$ ", 3' to 19' long.

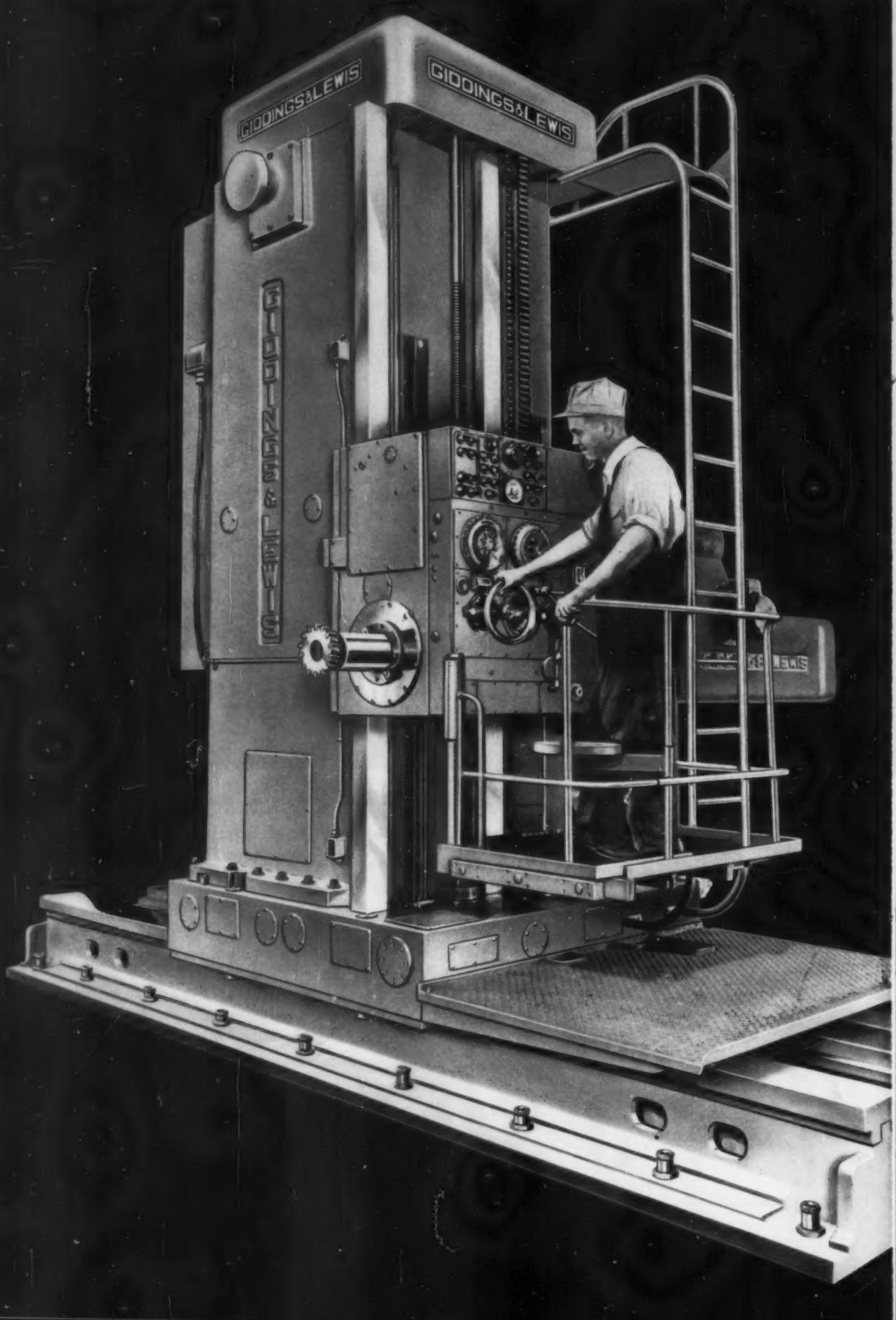
Operation: . . . Grind parallel sides.

Stock Removal: . . . Former discs—average of 179 lbs. of stock removed per set of discs.

GARDNER discs—average of 250 lbs. of stock removed per set of discs.

*The tangible benefits of more efficient disc grinding can also be applied to your particular production. Call your Gardner Abrasives Man for demonstration.*

**GARDNER**  
**abrasive discs**  
**BELLOIT, WISCONSIN**



# This new G&L machine can help you halt rising production costs

## 40 Series floor type Horizontal boring, drilling and milling machines offer—

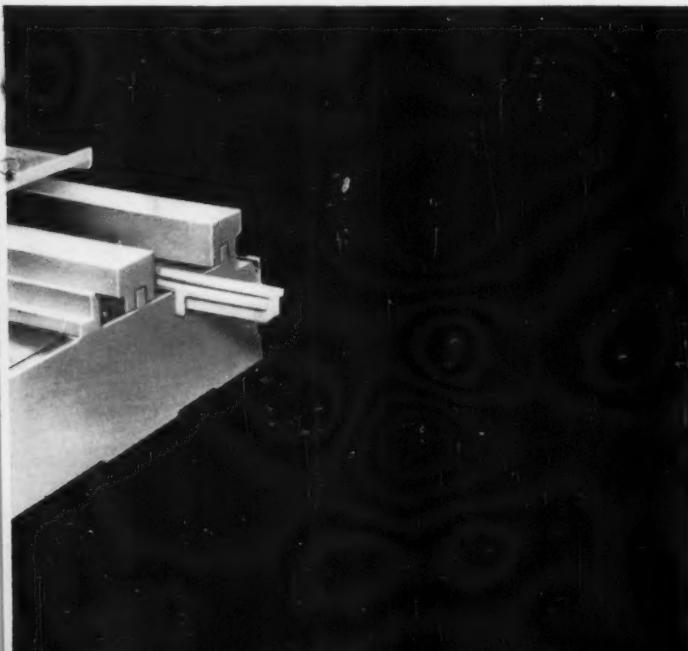
**HEAVIER CUTS**—Giddings & Lewis 40 Series floor type Horizontals answer today's demand for closer production tolerances, faster metal cutting, higher production . . . offering a total of 32 speeds from 3 to 800 rpm. 30 hp spindle drive motor provides ample power for highest metal removal rates — fully utilizing HSS or carbide tooling.

**IMPROVED ACCURACY** — All new G&L design construction provides exceptional rigidity, extra precision . . . holds dimensional accuracy at extreme limits of machine.

Choose from two G&L 40 Series 6" spindle machine types — the 460-F Floor Type and the 460-P Planer Type. Standard equipment includes non-metallic wear plates on column base, and headstock scales and adjustable verniers (.001"), telescopic vernier sights, two-way telescoping operators platform and complete independent control through multiple feed motors. Electric contour tracing control, underarm spindle support, end support and flame hardened ways on headstock column and runway are among many optional features.

In addition, a full line of accessories and attachments are available to broaden the machine's capacity or meet unusual machining requirements.

For further information on cost-slashing G&L 40 Series Horizontals, see your nearest G&L representative or write for catalog No. 40-F.



### G & L and HYPRO DIVISION GIDDINGS & LEWIS MACHINE TOOL CO.

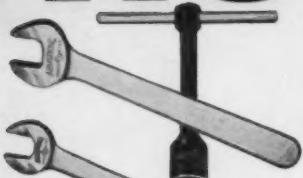
FOND DU LAC, WISCONSIN

G-79

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Milling Machines.

# ARMSTRONG

## WRENCHES



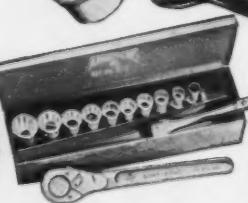
### Types and Sizes for Every Industrial Use

ARMSTRONG Wrenches have engineered designs, a wide safety factor of extra strength, accurately machined openings that go over screw heads or nuts easily, grip firmly —will not slip, round corners or mar faces.

Drop forged from special high tensile carbon and alloy steels, heat treated to an exactly pre-determined balance of hardness, toughness and tensile strength. ARMSTRONG Wrenches will not "chew out," will stand up through years of service, making work faster, easier and safer.

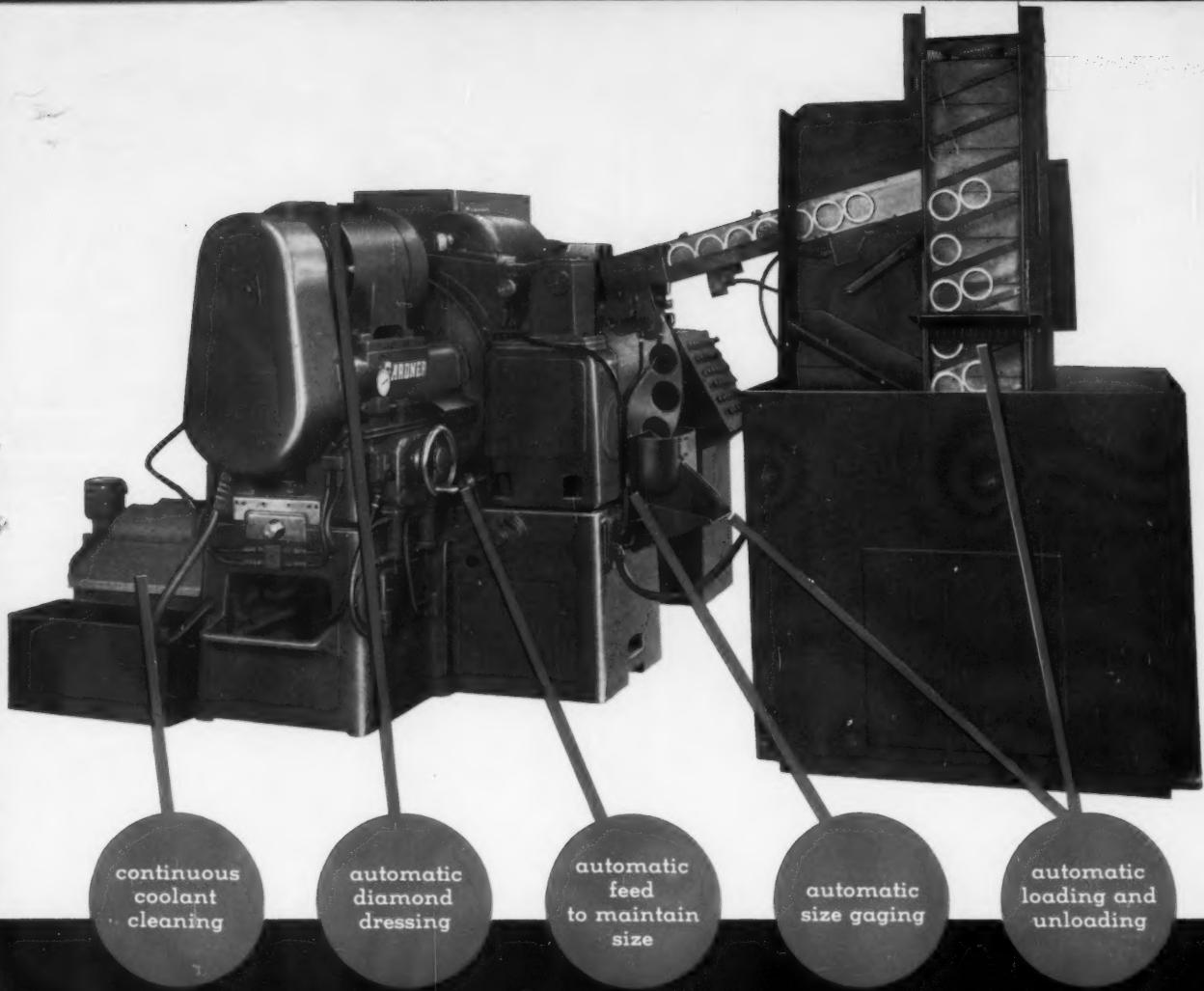
In sizes and types, ARMSTRONG Wrenches comprise the most complete line of industrial wrenches manufactured. Specify "ARMSTRONG" when ordering wrenches.

Buy  
ARMSTRONG  
TOOLS from your  
Industrial Distributor



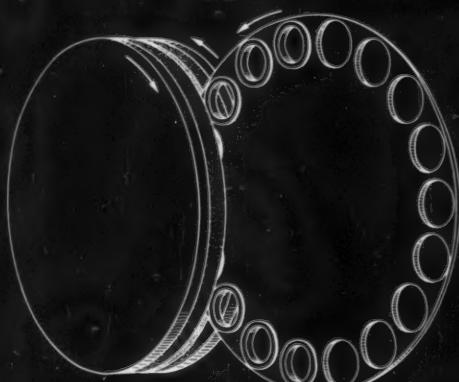
*Write for Catalog*

**ARMSTRONG BROS. TOOL CO.**  
5213 W. ARMSTRONG AVE. • CHICAGO 30, ILL.



## Automatic features increase productivity and maintain consistent accuracy

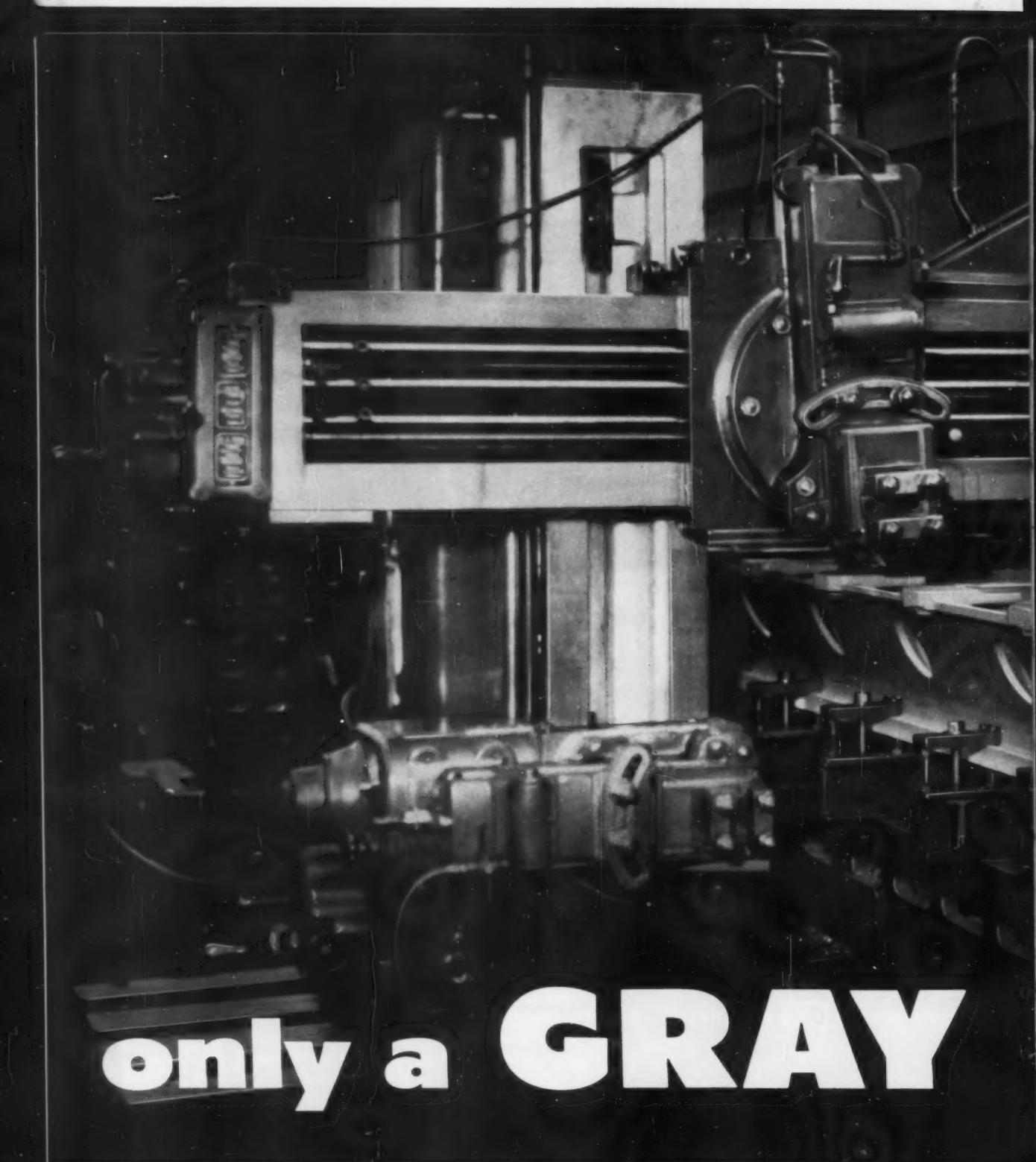
2H30 grinds **TWO** parallel sides of  
pump gear in **ONE** operation



### production data

Grinding: ..... 2 parallel sides of 4" pump gears  
Rate: ..... 600 parts per hour  
Stock Removal: ..... .015" maximum overall  
(semi-finish)  
.010" maximum overall (finish)  
Tolerances: ..... .0005" parallelism  
.002" uniformity

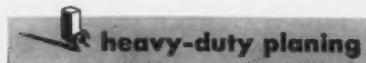
**GARDNER**  
precision disc grinders  
Beloit, Wisconsin



# only a GRAY

Cuts going—cuts coming . . . that's "double-cutting" with the GRAY Universal Planer. At Textile Machine Works, Reading, Pennsylvania, this new GRAY is pictured double-cut carbide planing a Tricot Machine Base. Former floor to floor time of 62 hours has been slashed to 12 hours by the enormous productive potential of the new GRAY that cuts both ways.

The G. A. GRAY Co., Cincinnati, Ohio.



The Gray Universal is the world's most powerful planer available for conventional planing. Its rigidity and speed are ideally suited for modern carbide cutting.

**GRAY**

# cuts both ways



## double-cutting

The flick of a lever, the touch of a button permits double-cutting. Elimination of the idle stroke insures the world's most efficient flat surface machining. Only simple carbide tools are required.



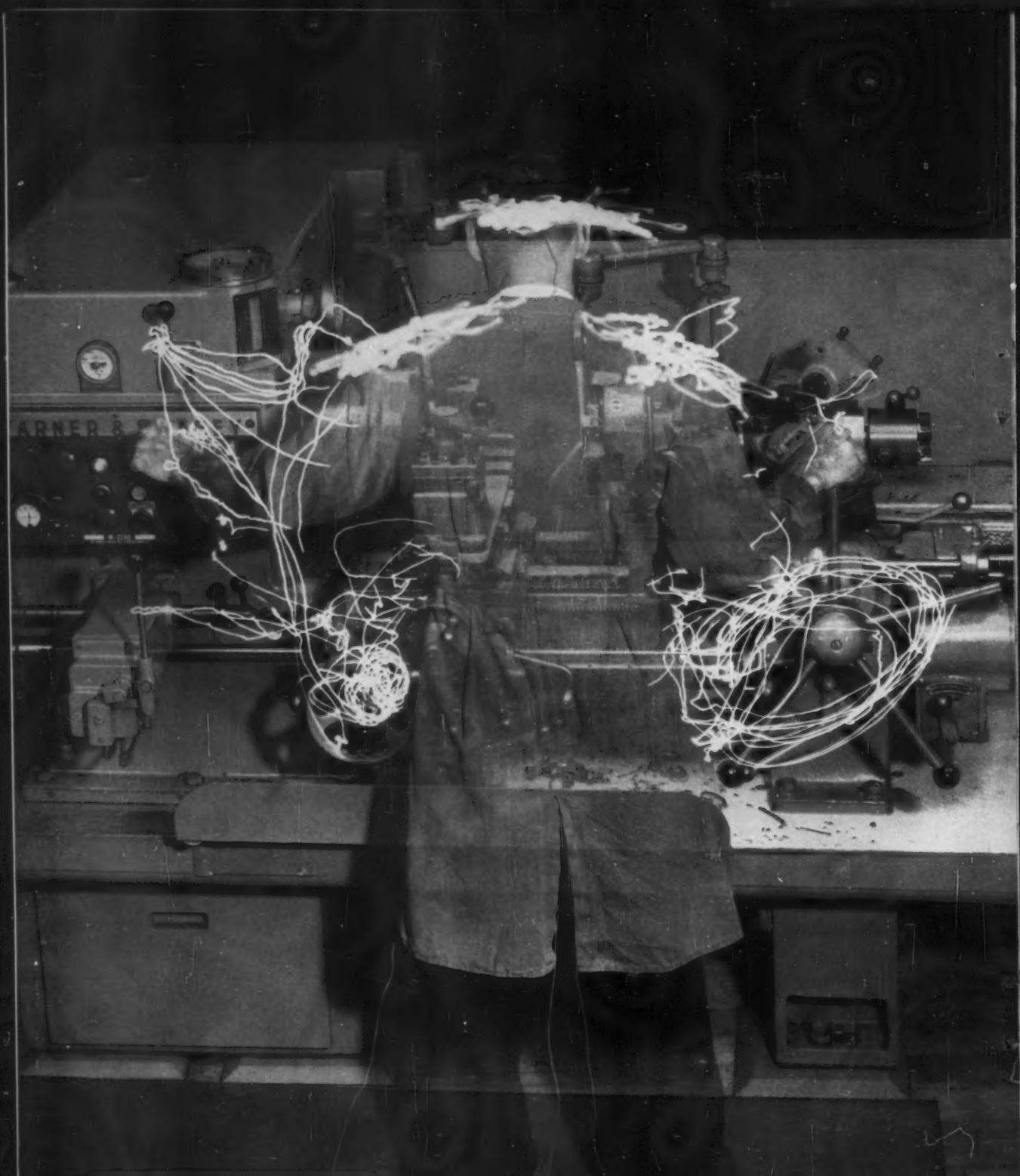
## triple-cutting

Rough and rough-finish plane at the same time. Rough by double-cut planing and simultaneously rough-finish with a single point tool. Then finish plane without a tool change.



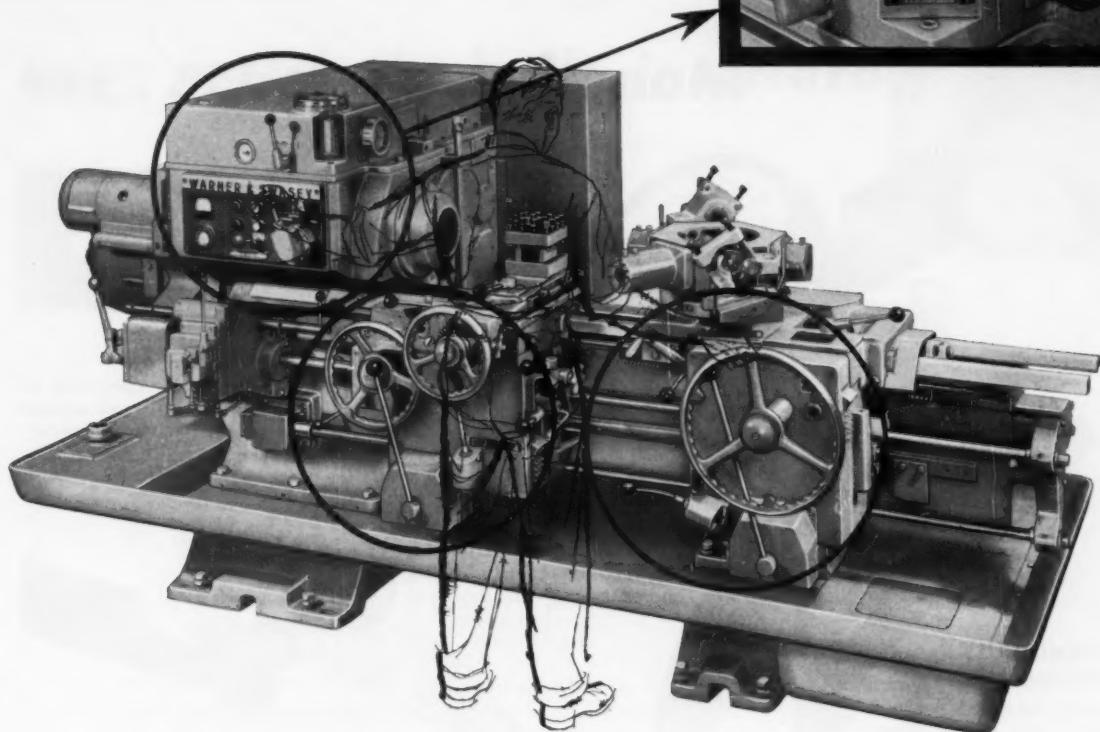
## cross planing

Eliminates extra settings by cross planing the occasional keyways, chamfered corners, and other troublesome small cross surfaces that formerly added hours to your set-up time.

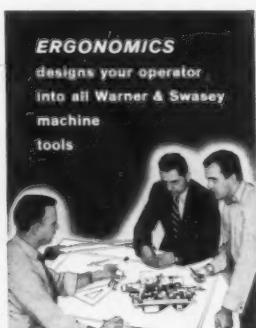


**Ergonomics in action!** This triple-exposure light trace photo is graphic evidence that Warner & Swasey's ergonomically designed machine controls definitely reduce operator fatigue while increasing both his efficiency and productivity.

This exclusive Warner & Swasey Speed Preselector, heart of the "zoned controls" system, enables the operator to preselect the correct speed for each cut, with just a glance-and-a-twist of the knurled knob. Proper speeds are chosen for the required cuts on the job and then marked in sequence with numbered clips placed on the top of the chart drum. Just a touch of the lever instantly shifts the machine to the next desired speed.

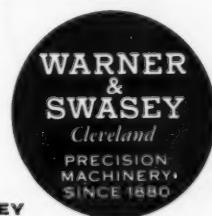


## Warner & Swasey "**ZONED CONTROLS**" boost production by helping increase operator efficiency



Known throughout industry as "the operator's machine", Warner & Swasey turret lathes are painstakingly designed with the human element in mind. They provide easy-to-handle operating controls, compactly arranged at convenient levels that minimize stooping and reaching—all of which contribute to increased operator satisfaction and higher production. Heart of the "zoned controls" system is Warner & Swasey's exclusive Speed Preselector—calibrated in surface feet and spindle RPM's versus work diameters—that encourages operator use of the proper spindle speeds for the particular job being machined. Additional single lever control features praised by operators include: A fast, simple change for spindle speeds; apron feed levers with "feel" control; four-way carriage rapid traverse; easy operating turret units and hydraulic collet chuck and bar feed control. For more detailed information about the adaptability of Warner & Swasey turret lathes to your particular machining problems, call in our Field Representative, today.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY





# Looks Can Deceive...

**Many have tried . . . yet**



## 3 TYPES

### PERPENDICULAR MODEL

Specially designed for use on jig borers and in other awkward positions.



### NON-MAGNETIC MODEL

Non-magnetic construction for use on magnetic chucks, and other magnetic fixtures. Attractively finished in natural brass.



### REGULAR MODEL

Shown actual size. Adaptable to all tool posts, height and surface gages without need for cumbersome, error-producing attachments.

### WHY the Testmaster is so Amazingly accurate

Its Movement is designed and built by the world's foremost gage specialists

Rigid case construction maintains proper alignment of Movement.

Jeweled bearings throughout assure low friction operation and maximum sensitivity.

Rigid steel lever provides faithful transfer of point motion.

Accurate crown gear provides simple, direct, low friction transfer of lever movement to hand . . . and uniform wear.

Precisely machined dovetail slides at bottom and end offer choice of attachment location.

Gears are precision hobbed for maximum Accuracy.

### HARD CHROMED, PRECISION INDEX POINTS



Tungsten tipped points are also available for extra durability.

Index Point locks in place but is easily removed for replacement. 180° swivel of Point permits wide choice of instrument positioning.

### ONLY 2 DIALS TAKE CARE OF ALL ENGLISH MEASUREMENTS



Don't fill up your tool crib and pay for a lot of confusing dials.

Dials graduated .001" or .0001". (Metric, .0025 mm or .010mm). Easily adjustable for zero setting in any position.



# Performance Will Tell You!

**none match the built-in accuracy of the**



**Many universal test indicators are "look-alikes". Each year it seems somebody else decides to copy the Federal Testmaster. But however closely its appearance is imitated, you can always tell the Testmaster by the accuracy of its performance . . . and that's what counts!**

No other gage has a Movement like the Testmaster. Actuated by a lever and crown gear, and with jeweled bearings throughout, the Testmaster has exceptional sensitivity and long, repetitive accuracy throughout its range. Its time-proven Movement is not to be confused with "spiral groove" gages whose accuracy is uncertain due to inherent friction and irregular wear. Nor should it be confused with other Movements where friction, looseness of fits, end shake in pivots, and uneven contact pressure contribute to unreliable performance.

The Testmaster is designed by the world's largest gage manufacturer and is ruggedly constructed to give lasting service in shop or toolroom where small size and versatility are often so important in an instrument.

The Testmaster is simple to use and the variety of its applications is almost limitless.

*Ask* **FEDERAL** *First*  
FOR RECOMMENDATIONS IN MODERN GAGES . . .

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Please send information and prices on the Federal Testmaster.

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Company \_\_\_\_\_

Address \_\_\_\_\_

# DR. GOODES

by ROGER PRICE



Bench Model BC-7D



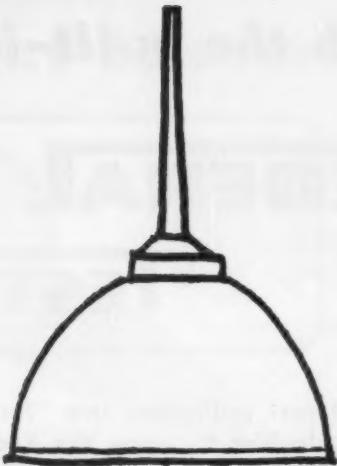
Floor Model FC-30



Floor Model FC-14



Table Model TC-14  
(Vertical Inspection)



## "SPRING TONIC"

The subject of "oiling up" reminds me of my uncle Gus, the temperance lecturer. Over the years, he made a fortune denouncing the demon rum from the rear platform of a converted water wagon. His impassioned sermons were terror-inspiring, and men fought to enroll in his "Nay-Nay" Club at two bucks a head, for which they received a fancy certificate and a temperance badge. The crowds loved Gus, although they often commented on his odd habit of always munching oranges. I've often wondered what would have happened if they'd learned of Gus's other habit: privately hypo-ing each orange with a few cc's of gin. But, luckily for him, his secret never leaked out,

and he continued to be a howling success.

All of which leads me to remind you, in my shy, roundabout way, that your quality control operations can be a howling success, with the help of J&L Optical Comparators. These remarkably precise measuring and inspecting instruments are being used throughout industry to assure accuracy of manufacture. The J&L Comparator rapidly inspects all sorts of parts and objects, in a variety of sizes and shapes. It's ideal for inter-operation inspection; and it's so flexible, it enables you to perform inspections that aren't possible by any other method. Available in eleven different models, both bench and pedestal types. Write for catalog today.

## JONES & LAMSON OPTICAL COMPARATORS On the Job . . .

at John Dusenberry Co., Inc.  
Verona, N. J.



This company, manufacturer of Dusenberry Converting Equipment, uses and recommends Jones & Lamson Comparators for inspecting the precision of knife grinding operations. The comparator, with a visual power magnification of  $62\frac{1}{2}$  X, projects the image of the knife edge on a grid screen showing exact radius dimensions to 1/1000 of an inch. The comparator has been found to be the only device capable of accurately checking knife edge radii.

"The originator of machine tool standards in optical inspection"

# JONES & LAMSON

JONES & LAMSON MACHINE COMPANY, Dept. 710, 512 Clinton Street, Springfield, Vt., U. S. A.

Please send me Comparator Catalog 402-C, which describes the complete line of J&L Optical Comparators.

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# INCREASED DEMANDS

of AUTOMOTIVE INDUSTRY...  
met with

## BULLARD Mult-Au-Matic, Type "L"

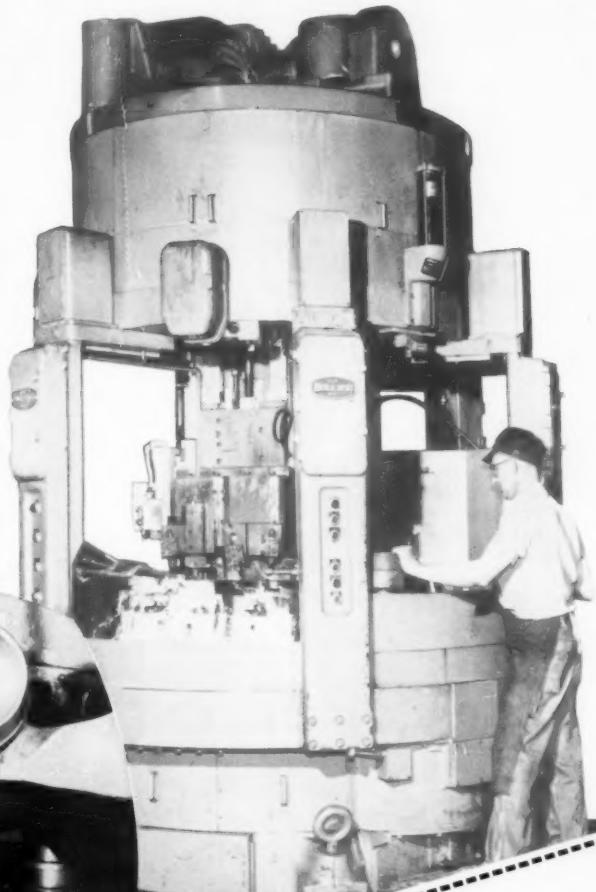
The challenge to supply the increased requirements for automatic transmissions needed to meet automobile manufacturers' schedules was solved at the Midwestern plant of a leading manufacturer of automotive parts with a 10" 12 spindle, single index Bullard Mult-Au-Matic, Type "L".

At present, the machine is tooled for the front drum of an automatic transmission and delivers a finished piece — turned, bored, counterbored and faced — with each index of the table — one every 63 seconds. The end result — more finished pieces per hour at less cost per piece.



Remember  
to cut costs when  
cutting metal —

buy **BULLARD**



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THE BULLARD COMPANY  
Please send me a copy of the NEW MULT-AU-MATIC, TYPE "L" CATALOG

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State \_\_\_\_\_

Call your nearest Bullard Sales  
Engineer — he'll show you how.

THE BULLARD COMPANY BRIDGEPORT 9, CONNECTICUT

# **5 Basic Reasons why MARVEL HACK SAWS CUT-OFF MORE ACCURATELY...**

The consistently accurate performance of MARVEL Heavy Duty Hack Saws is no accident. MARVEL engineers knew, many years ago, that to produce and maintain accurate cutting-off, a hack saw must be designed and built like a fine machine tool.

Some of the basic design principles built into the modern MARVEL Hack Sawing System that makes it the most accurate cutting-off method you can use are:

## **1. V-Way Design...Greater Rigidity**

Upright and Saddle are precision machined and fitted to form a rigid, integral unit capable of withstanding any cutting load with no deflection or side movement.

## **2. Anti-Friction Bearing Construction**

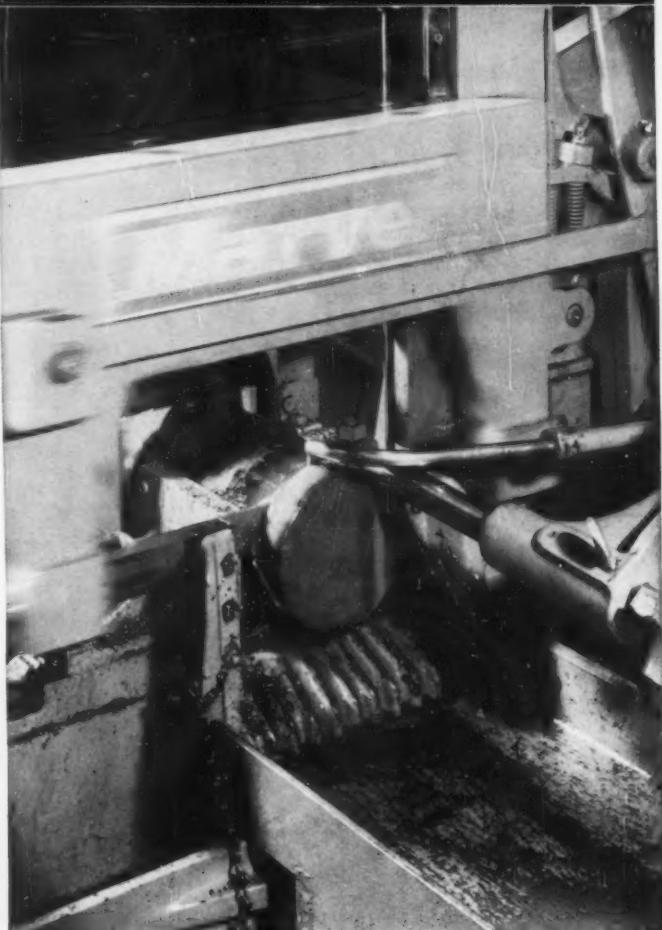
Anti-friction ball or roller bearings are used at all load carrying points. Even the strongly braced saw frame reciprocates on heavy duty, fully enclosed preloaded ball bearings which provide permanent, frictionless rigidity and true-running, straight line cutting strokes.

## **3. Minimum Blade Frame Reach**

Close-coupled design and crank lever action of MARVEL Saws keeps the saw frame and blade reach very short in relation to the vertical V-ways on which the unit is mounted. This insures optimum rigidity, even under the most severe operating conditions.

## **4. Positive Relief Blade Lift**

On the return stroke, positive relief lift raises the blade to provide proper and "cushioned" lead-in on the next cutting stroke. This prolongs blade sharpness, life and accuracy.



## **5. Rigid Cutting Tool**

Cutting-off accuracy requires a rigidly held, relatively short cutting tool. MARVEL Unbreakable High-Speed-Edge Hack Saw Blades, which combine a narrow high speed steel cutting edge permanently welded to a tough alloy steel body, can be tensioned from 200% to 300% more taut than ordinary blades. This provides a most rigid cutting edge.

Write for the MARVEL Catalog and the complete story on  
MARVEL METAL CUTTING SAWS



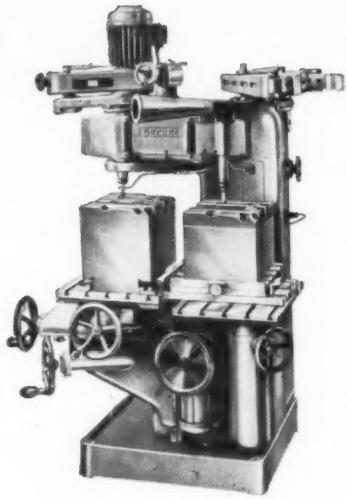
**MARVEL**  
Metal Cutting  
**SAWS.**  
Better Machines—Better Blades

**ARMSTRONG-BLUM MFG. CO.**  
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# Precision Machine Tools

## For Every Metal Working Need



Deckel KF Universal Pantograph Die Sinker For 2- and 3-Dimensional Work

At Cosa you can choose from a complete selection of the world's finest machine tools and metal working equipment — for production line or tool room use. Standing behind every Cosa machine is a nation wide sales-service organization that offers you:

**Sales Engineering** — Machine tool experts will assist you in selecting the right equipment for your production needs.

**Installation** — Factory-trained technicians will supervise installation, check performance, and instruct operators for best results.

**Guarantee** — Each Cosa machine is guaranteed against defective workmanship or materials for one year after delivery.

**Service** — Cosa's competent staff of skilled servicemen will help you to maintain peak performance — with quick delivery of spare parts.



Bechler Swiss Automatic AR-10  
With 6-Tool Drum Turret



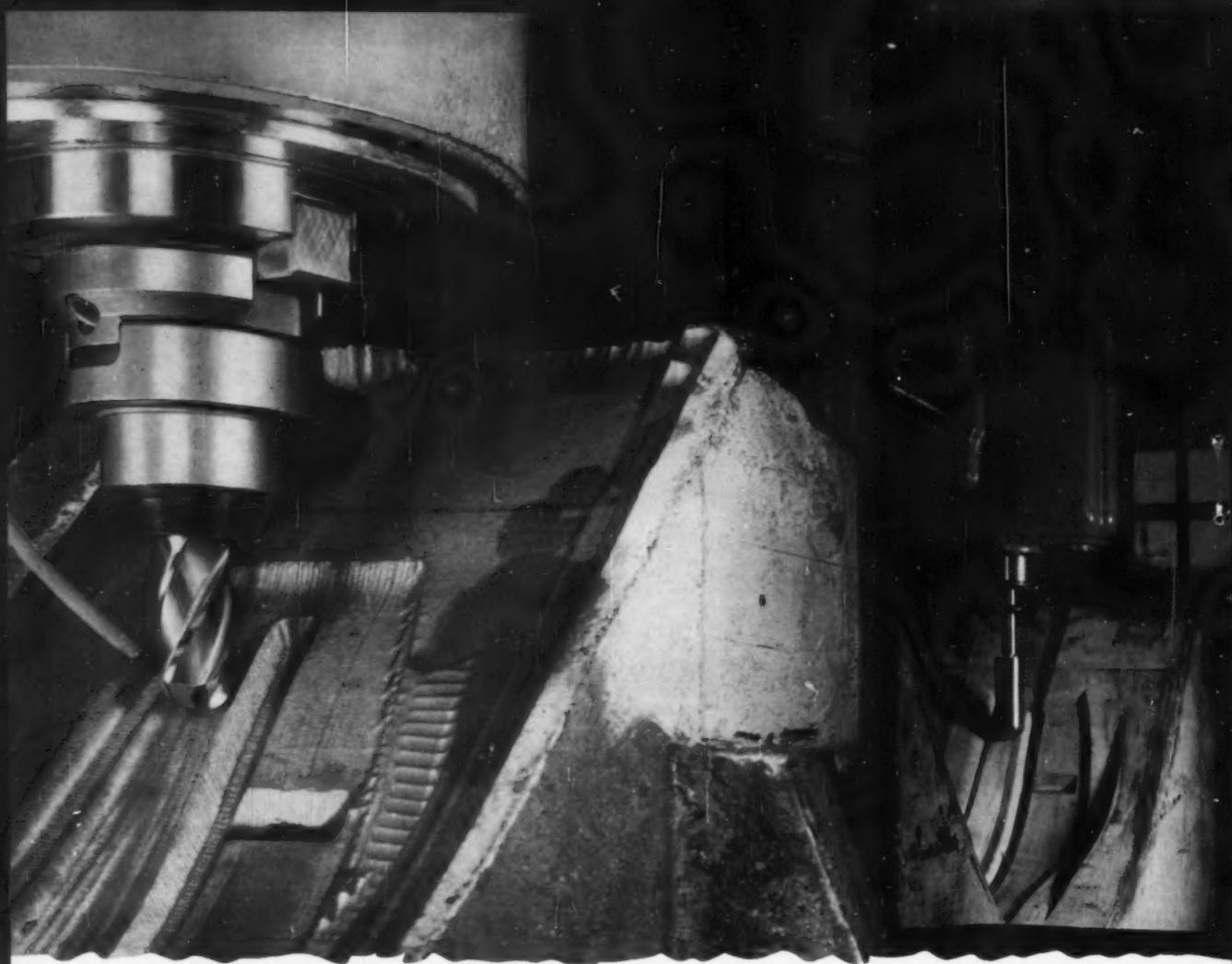
Kolb Optical Jig Borer For Positioning Workpieces To Within .00005"

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- Automatic Screw Machines—Swiss
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- Precision
- Vertical
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- Gear Checking and Testing
- Machines
- Gear Grinders
- Gear Hobbers
- Grinding Machines
- Cam & Contour
- Plain Cylindrical
- Drill, Tap and Flute
- Splines
- Thread
- Tool & Cutter
- Universal
- Jig Borers
- Keyseaters
- Lathes
- Automatic & Semi-Automatic
- Bench
- Double End
- Engine & Tool Room
- Facing & Right Angle
- Gun & Shaft Boring
- Special
- Vertical Turret
- Milling Machines
- Contour
- Die Sinking
- Plain
- Planer
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**COSA** — nationwide sales and service of precision machine tools — from bench lathes to boring mills.

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

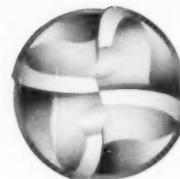


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New CLEVELAND 4-flute center cutting End Mills reduce individual end tooth shock and assure smoother cutting action, particularly in plunge milling.

The advanced design of 4-flute 500 Series High Speed End Mills is your assurance of *accuracy* and *high production* in both tracer and general purpose milling. The accurately form-ground notches and the precision ground cutting edges give you absolute uniformity and *positive chip removal*. ♦ Try these new CLEVELAND End Mills on your next job. Get all the advantages of 4-flute mills and *plunge cutting, too!* Contact our nearest Stockroom, or . . .

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BALL NOSE



SQUARE END

In both the ball nose and square end types, the rake angle is uniformly progressive from zero at dead center to blend with the hook in the cutting face of the flutes.



**THE CLEVELAND TWIST DRILL CO.**

1242 East 49th Street • Cleveland 14, Ohio

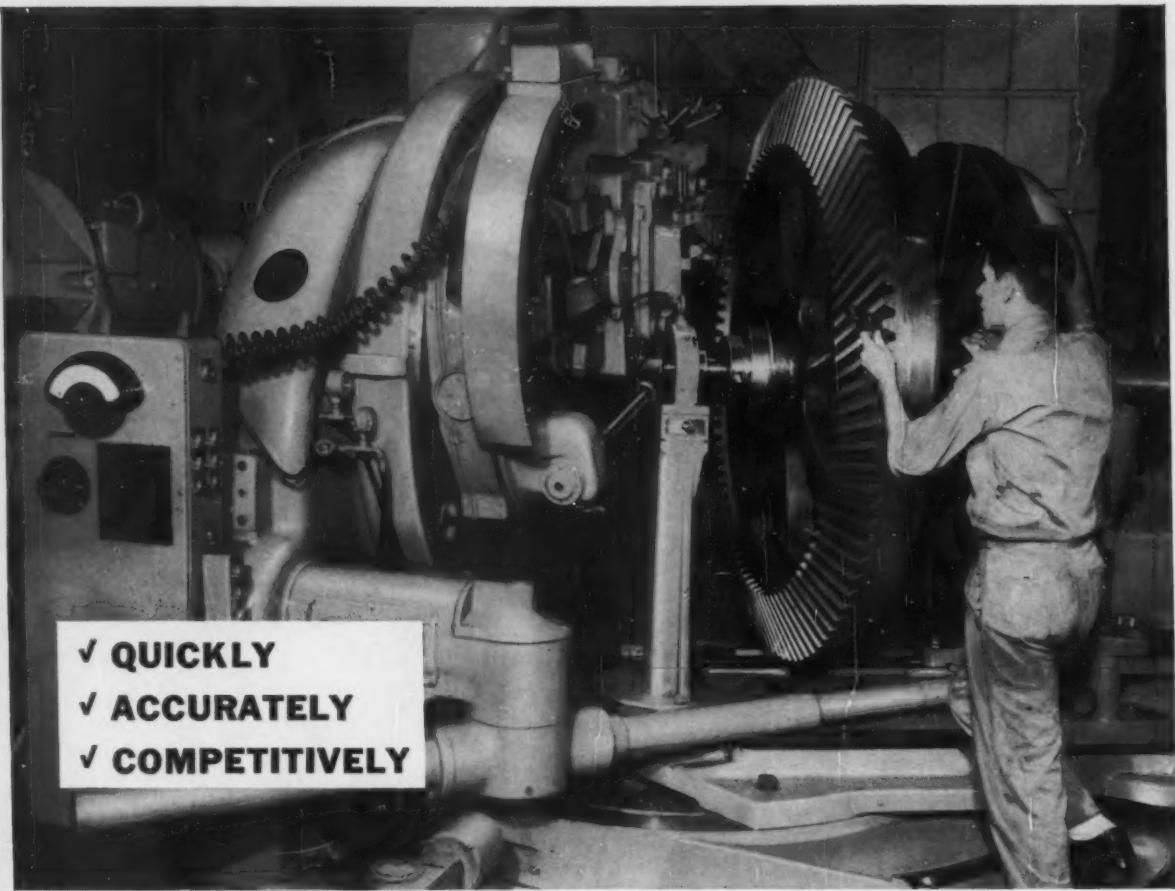
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**INNOCENTI**

CWB Universal Milling and Boring Machine

Milan, Italy



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PHILLIE GEAR's new #70 Bevel Gear Generator will cut the widest possible selection of Spiral-Bevel, Zerol and Hypoid Gears, in diameters up to 72", and face widths to 10". Even in these massive sizes, accuracy of tooth form and optimum load carrying characteristics of pinion and gear are positively assured.

Philadelphia Spiral Bevel Gearing is hardened to produce a tool-like surface, yet, retain a resilient core to withstand high shock loading. Finally, every gear set is lapped on special test machines to ensure best possible tooth bearing.

Philadelphia Spiral Bevel Gears—in any quantity, size, and ratio are quickly

and correctly manufactured to your specifications.

The installation of this modern gear generator, is another step forward in making Phillie Gear one of the World's best equipped, largest and most progressive gear manufacturing plants. Your inquiries will be fully analyzed to provide the most economical and satisfactory gearing obtainable—also whenever requested Philadelphia engineers will make a stress analysis of gear loading to further insure satisfactory operation.

Send for the Philadelphia Gear Design Manual G-655—kindly use your business letterhead.

# phillie gear®

INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID MIXERS • FLEXIBLE COUPLINGS

Limitorque Corporation • Philadelphia

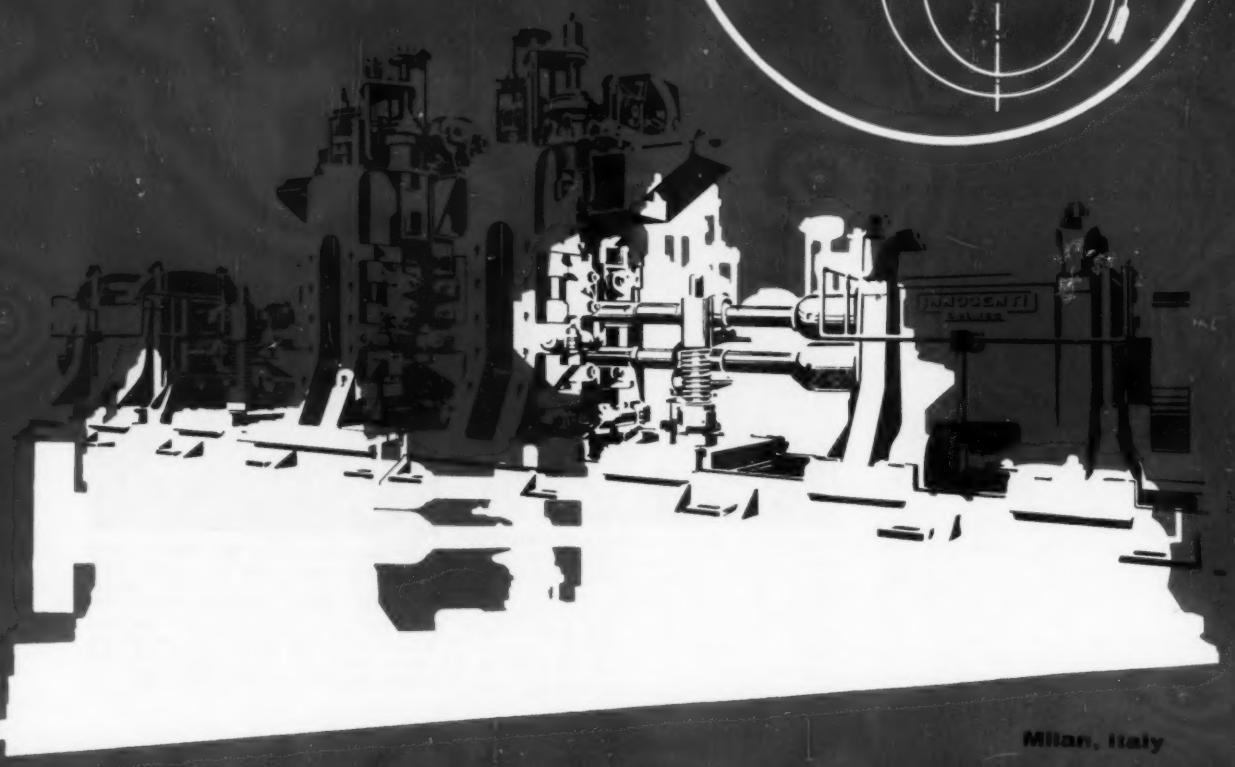
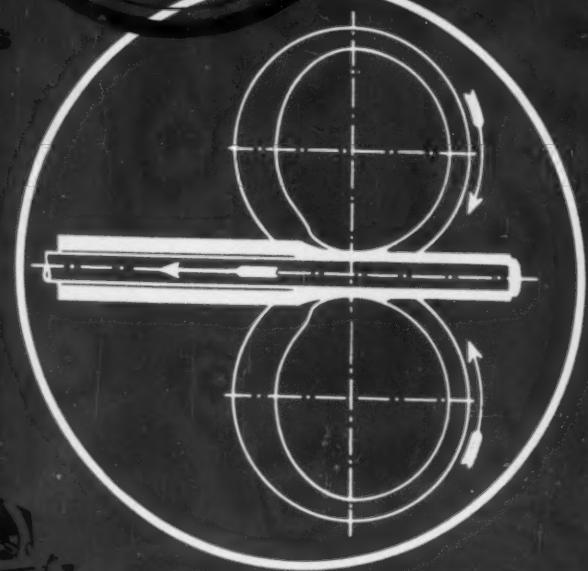
PHILADELPHIA GEAR WORKS, INC.

ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.

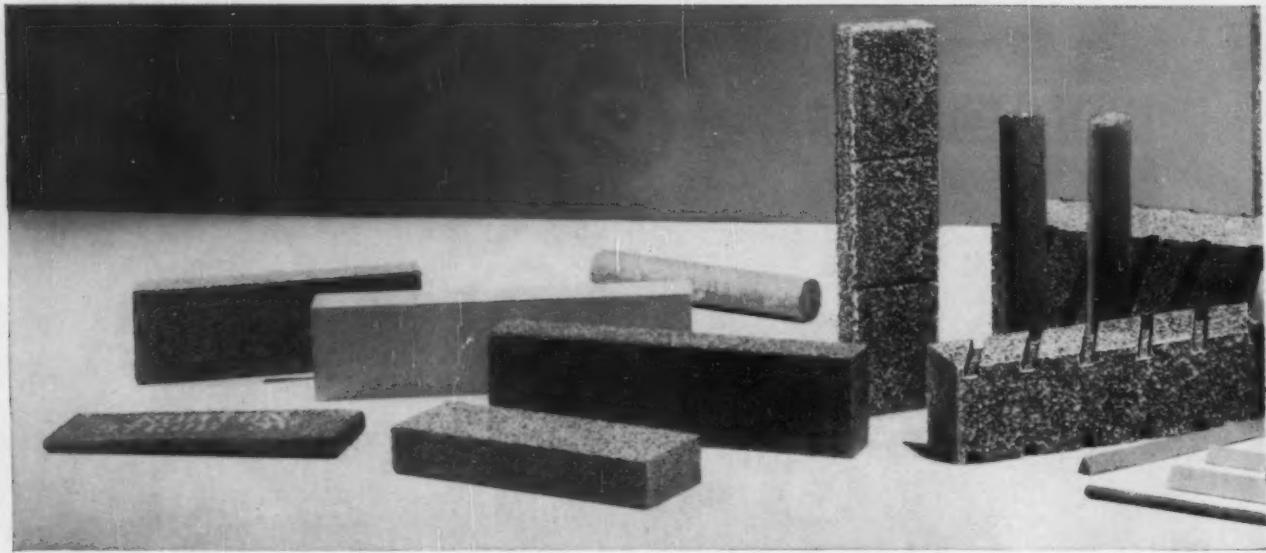
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**INNOCENTI**

**tube rolling mills**



Milan, Italy



## Handy, money-saving "First Aids"



**For many wheels a CRYSTOLON\* dressing stick does an excellent job in maintaining a uniform cutting surface.** With each different type of the famous Norton diamond wheels, for example, a CRYSTOLON stick is supplied in the right degree of hardness for best results in dressing. ALUNDUM\* sticks are excellent for smoothing die areas, and Norton BF sticks of ALUNDUM abrasive, reinforced with cotton fiber, are often preferred for breaking edges, hand finishing molds and other small parts.



**A NORBIDE\* dressing stick takes no time,** practically, to touch up a cup or saucer wheel, clean up a wheel face, or form a radius or groove. Just a couple of passes is all you need, in fact, because this outstanding Norton development is next to diamonds in hardness, costs only a fraction of diamonds, and outlasts hundreds of ordinary sticks.



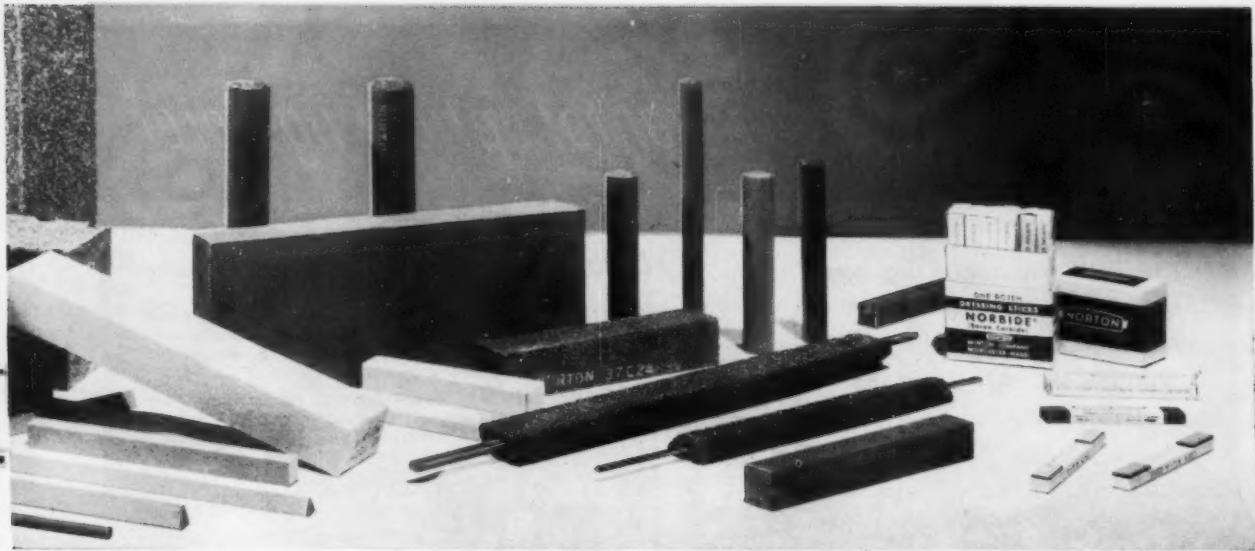
**Hardest of all is the Norton diamond hone.** Here a vitrified diamond hone is working on the side cutting edge and nose radius of a carbide tipped tool. Honing lightly at a 45° angle is worthwhile protection when the carbide is used for making heavy cuts in steel, since steel scale and chips may cause an extremely sharp edge to flake off.



**Cleaning up castings with a CRYSTOLON brick** is a quick and handy way to remove sand, scale and parting lines. Bricks of this fast-cutting abrasive are made in a wide range of sizes and shapes, plain surfaced or slotted. They're also highly valuable in a variety of plant maintenance operations, such as smoothing off concrete foundations, walls, or other masonry jobs.



**Core files are useful for shaping and smoothing sand cores** for hollow castings. Like the Norton bricks they're made of CRYSTOLON abrasive, which gives them the same fast cutting action. And because of their long, slender shapes they're reinforced with metal rods, for added strength and ease of handling.

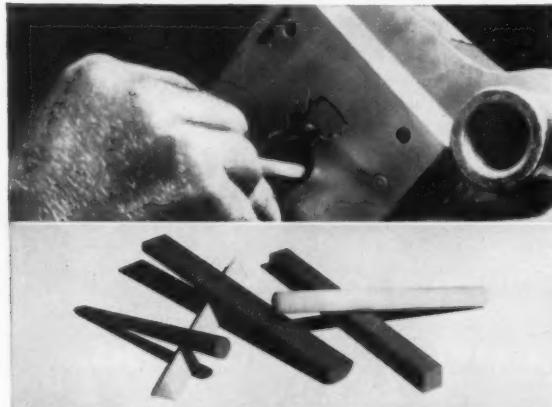


## for plenty of plant jobs

Norton bricks, sticks, hones, core files,  
keep many of your tools, products and  
equipment in top condition

With Norton bricks, sticks and other hand-operated smoothing implements, you can simplify many everyday plant jobs. You can cut time and expense, too, because you eliminate adjusting or

running any machines. Ask your Norton Distributor about all the advantages. Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors all around the world.



**Behr-Manning Division files** are noted for fast, smooth stoning and honing of dies, as well as sharpening. The round file shown in action is an INDIA oilstone. In the smaller photo, Behr-Manning oilstone files for many other industrial uses include INDIA point, half-point and square shapes, and ARKANSAS triangle and round shapes.

**NORTON**  
**ABRASIVES**

*Making better products... to make your products better*

**NORTON PRODUCTS**  
Abrasives • Grinding Wheels • Grinding Machines • Refractories  
BEHR-MANNING DIVISION  
Coated Abrasives • Sharpening Stones • Behr-cat Tapes

\*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

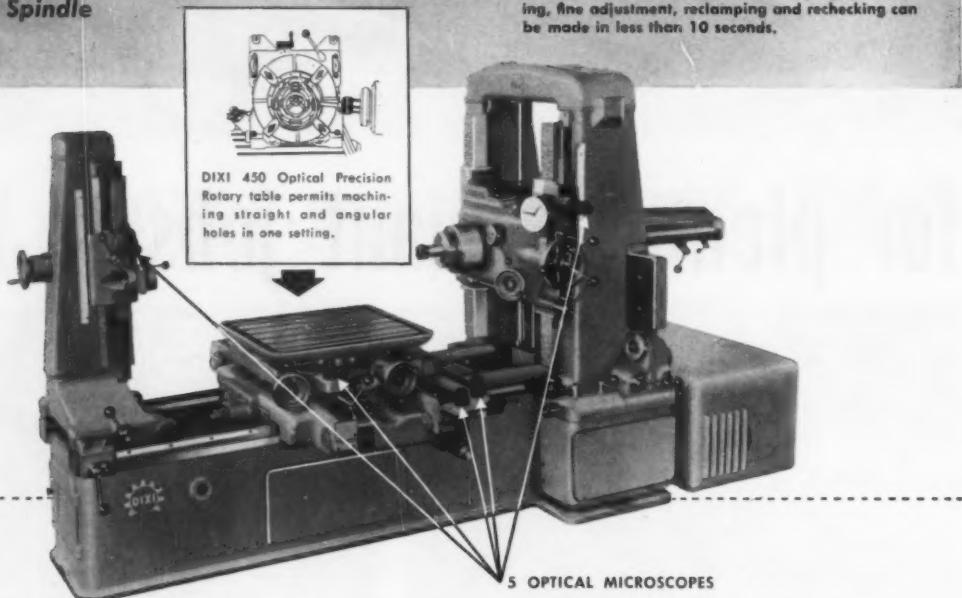
# DIXI 60 horizontal optical jig borer

The ONLY Horizontal Jig Borer  
 Built Today! Combines the  
 ACCURACY of the Vertical Spindle  
 With the VERSATILITY of the  
 Horizontal Spindle

**ACCURATE:** Optical settings provide an overall accuracy of .0002.

**VERSATILE:** Optical settings for operations in all planes and compound angles . . . equally suitable for tooling, short-run or production work . . . permits JIGLESS boring, facing, milling and drilling.

**PRODUCTIVE:** Saves time, labor & costs . . . Unclamping, positioning, fine adjustment, reclamping and rechecking can be made in less than 10 seconds.



5 OPTICAL MICROSCOPES

The DIXI Optical Reversing Process assures perfect alignment as well as round, taper-free holes. In work pieces with line bores on opposite sides, this is obtained by optically indexing the built-in rotary table 180°, locking the spindle feed and using the hydraulic table in-feed instead. Electrical infinitely variable speed spindle drive; infinitely variable hydraulic feeds; special features eliminate effect of spindle overhang on accuracy.

Made in Switzerland

All measurements in inches

- Guaranteed service by factory trained staff
- Engineering staff available for consultation
- Spare Parts in New York stock
- Your operators trained

DIXI 60 now in wide use in leading aircraft and manufacturing plants throughout the United States.

THIS VERSATILE MACHINE IN OPERATION at our New York, and other conveniently located Demonstration Centers.

Our Headquarters  
in New York City



MACHINERY BUILDERS INC.  
MBI EXPORT & IMPORT LTD.

**M. B. I.**  
**export & import ltd.**

A Division of Machinery Builders, Inc.

475 Grand Concourse, Bronx 51, New York

"Over 25 years experience in designing & building machinery"

# Feeling M-i-g-h-t-y Low?

IF GRINDING WHEEL PROBLEMS HAVE YOU DOWN IN THE DUMPS,  
DON'T MONKEY AROUND. Switch to CINCINNATI (PD)<sup>®</sup> WHEELS. For now CINCINNATI  
Grinding Wheels offer POSITIVE DUPLICATION—a remarkable achievement in precision  
manufacturing and quality control that can save you money . . . and increase your production.

You'll start every day with a big smile and a spring in your step when CINCINNATI (PD) WHEELS are on the job. For through the CINCINNATI (PD) Manufacturing Process you are assured Positive Duplication of the original wheel *every time* you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

*Yet CINCINNATI (PD) WHEELS are priced no higher than ordinary wheels.*

So, let us help you see the bright side of life once more. Just contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio. Remember—*only CINCINNATI Grinding Wheels give you . . .*

(PD) POSITIVE DUPLICATION

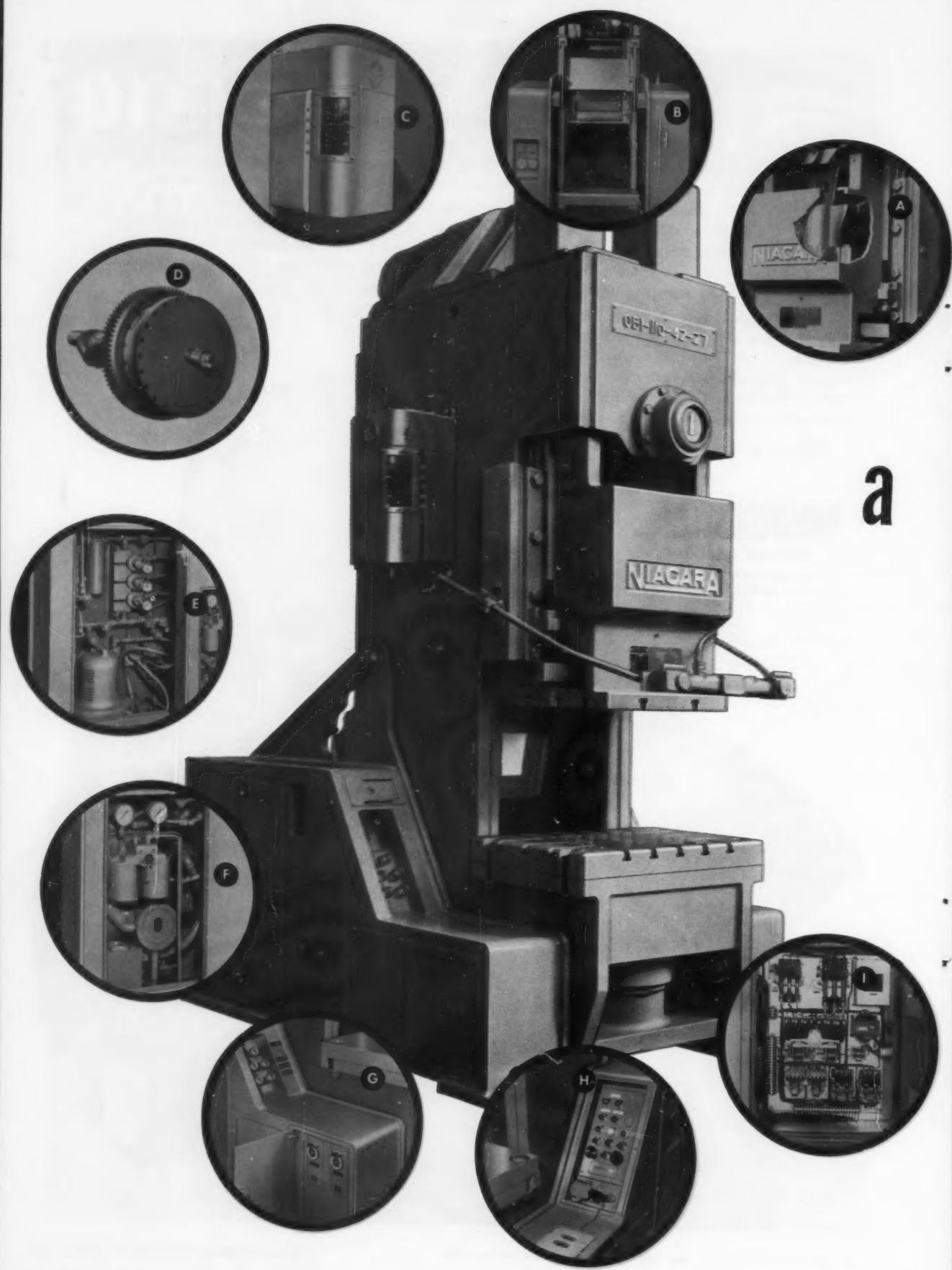
**CINCINNATI**  
*Grinding Wheels*

A PRODUCTION-PROVED PRODUCT OF  
THE CINCINNATI MILLING MACHINE CO.

\*Trade Mark Reg. U. S. Pat. Off.



a





# truly revolutionary line of OBI's automated to hit new production highs

Never before has there been an OBI like this. In feature after feature, you'll see pulse-quickenning newness that will inject speed and rhythm into your production. Outfitted with today's most advanced controls and devices, this all-new Niagara Series EA offers you automation at its very best.

Boasting a revolutionary front-to-back crankshaft design, it's streamlined in an ultra-modern, functionally sound, eye-pleasing way. In fact, it's the only totally-enclosed OBI ever made. There are no exposed, overhanging gears, flywheel or other mechanisms. With the entire driving assembly fully enclosed within the limits of the compact frame, this trim-line performer actually takes up less floor space than any press in its range and category. It's only natural that such a triumphant line of OBI's as this should parade from Niagara . . . for Niagara has been leading the way, *all of the way*, in building all types of OBI's—single crank and double crank, standard and fully automatic. Hailed as "the latest and greatest of them all," the Series EA is built in 4 sizes, with shaft diameters from 4½ to 7½ inches and capacities from 75 to 200 tons.

**FULL DETAILS ARE YOURS FOR THE ASKING:**  
Write for illustrated Bulletin 56 today!

NIAGARA MACHINE & TOOL WORKS, BUFFALO 11, N.Y.  
DISTRICT OFFICES

Boston • Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia  
Distributors in principal U.S. cities and major foreign countries



# NIAGARA

## front-to-back crankshaft AUTOMATED INCLINABLES

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work

**A** POWER OPERATED BARREL TYPE SLIDE ADJUSTMENT facilitates and speeds die-setting. Push button operated, it's not only fast and smooth but permits micro-positioning within a thousandth of an inch.

**B** HYDRAULIC INCLINING DEVICE operates smoothly. The press can be inclined or brought upright in approximately 2 minutes. Operating lever and push buttons conveniently located on left panel leg.

**C** BRAIN CENTER OF THE AUTOMATION SYSTEM, the Rotary Limit Switch can be adjusted precisely while the press is in motion for synchronizing automation devices with press cycle.

**D** LOW INERTIA, ELECTRO-PNEUMATIC FRICTION CLUTCH operates directly on the crankshaft. Most of its weight continues to rotate with the main gear. Only the crank-shaft and driving plate are started and stopped at each cycle. Heat and wear are reduced to an absolute minimum. Torque capacity may be changed by adjusting air pressure.

**E** AIR CONTROL PANEL AND HYDRAULIC INCLINING SYSTEM are neatly housed within the left leg. Air line filter, pressure regulator, gages, blow-off valves and lubricators, as well as the hydraulic pump for the inclining system, are all concealed behind a dust-tight door.

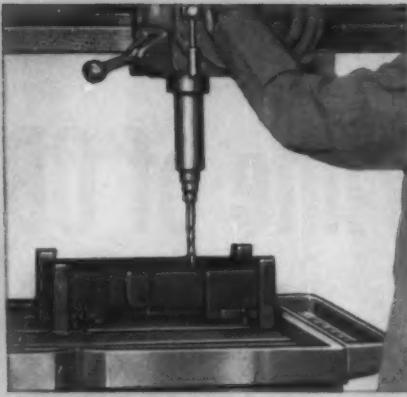
**F** AUTOMATIC CIRCULATING OIL SYSTEM (left panel leg) sends metered flow of clean, filtered oil to all bearings and gears in the crown, air counterbalance and slide gibbs. Correct operating oil pressure is maintained or the press stops automatically.

**G** CONTROLLED AIR SUPPLY AND PNEUMATIC TIMING RELAYS (left panel leg): Air line receptacles, synchronized with press cycle, are provided for die doper, die kicker and die lifter . . . with auxiliary receptacles for die maintenance tools. Adjustable timing relays control interval of automation functions initiated by rotary limit switch.

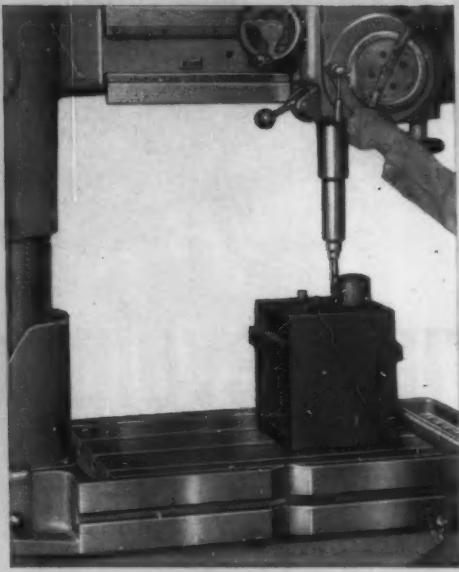
**H** OPERATOR'S PANEL (right panel leg) features deluxe operating controls conveniently arranged for fingertip direction of every press motion. Chained to safety block, safety plug de-energizes entire press control when pulled from its receptacle.

**I** COMBINATION MOTOR AND PRESS CONTROL PANEL fully enclosed within the right leg behind a flush-mounted, dust-and-oil-tight door, houses: disconnect switches, circuit protection, transformers, fuses for main motor and auxiliary power supply; control relays; starters for main motor, lubrication and hydraulic pumps.

PNEUMATIC CUSHION is automatically lubricated by self-contained pumping system; internally guided and rigidly supported by press frame.



SMALL WORK



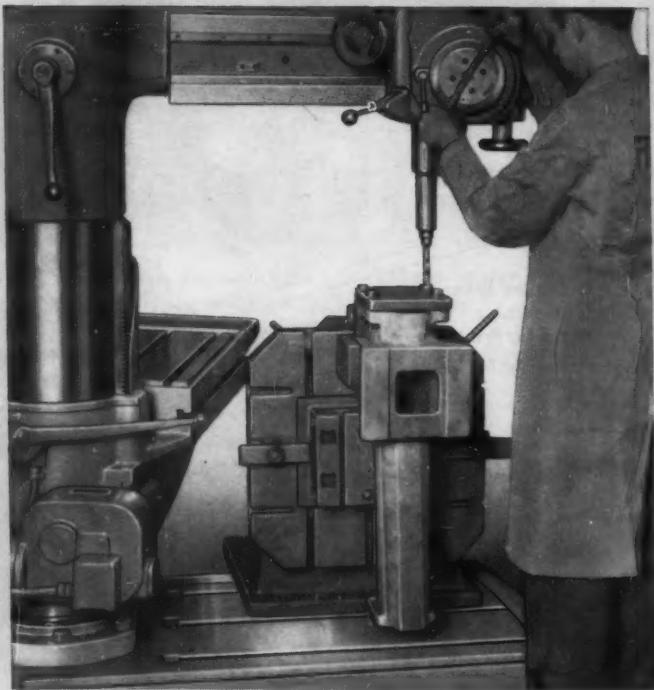
BIGGER...

# FOSDICK SENSITIVE RADIAL DRILLS

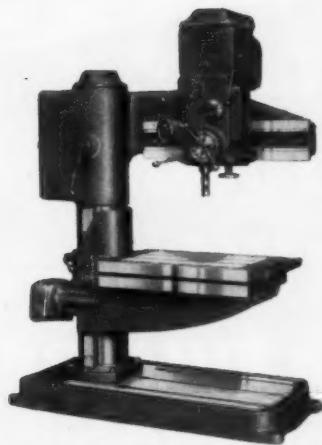
*sensitive to your*

We put a table on the radial to give you two machines in one—and a work size versatility that is unmatched in any drilling machine of comparable price and size!

Actually, the Fosdick Sensitive Radial combines the best features of two proven, reliable designs. The capacity and flexibility of a radial—the rigidity, compactness and convenience of an upright. For job shop work or production, it's the answer to useful capacity in limited floor space. Economically priced, too! The economy of first



## STILL BIGGER



**ALL THESE WORK SIZES ON ONE MACHINE—**  
The Fosdick Sensitive Radial Drill. Also available as a Layout Machine, which combines high precision compound table with sensitive radial drill.

*work size problem...and your pocketbook*

The arm of the Sensitive Radial swings 360° on the rigid one-piece column. Controls are always at the same convenient height. Work is placed on the adjustable table, or on the base with the table swung out of the way. Drills up to 2" in cast iron. 12" column, 3' or 4' arm, nine speeds (ranges from 60-1200 to 175-3500 rpm), four feeds (.004-.020 or .002-.010), 3 hp motor, reversing motor control for tapping.

Write today for complete information on the Fosdick Sensitive Radial Drill.

*Ask for Bulletins SRA and LMA.*

**NEED DRILLING EQUIPMENT?  
GET A PROPOSAL FROM FOSDICK!**

**FOSDICK**

THE FOSDICK MACHINE TOOL CO.  
CINCINNATI 23, OHIO

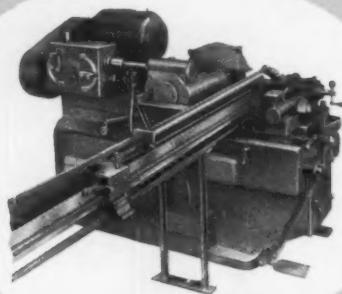
# **Expect greater economy and production**

**COCHRANE-BLY**

- Metal Sawing Machines

**TAYLOR and FENN**  
Machine Division

- Duplex Spline Millers
- Spring Presses
- Drilling Machines



**The CLEVELAND  
TAPPING MACHINE  
Company**

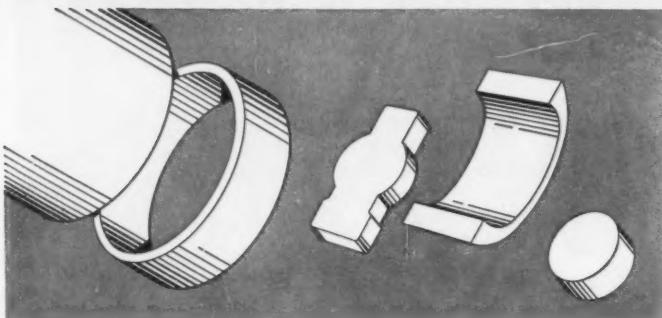
- Drilling and Tapping Machines
- Fitting Machines
- Indexing Tables

**The TOWNSEND  
MANUFACTURING  
Company**

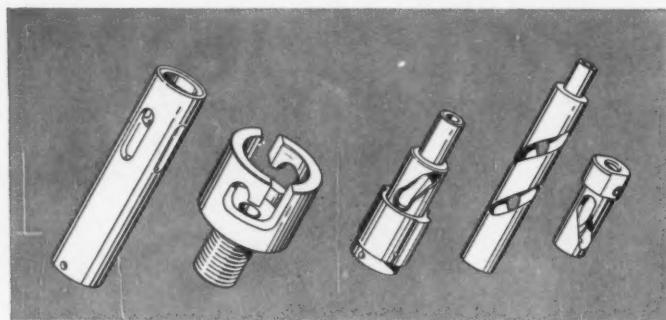
- High-Speed Shavers
- Riveters
- Automatic Screw Machines
- Special Machines



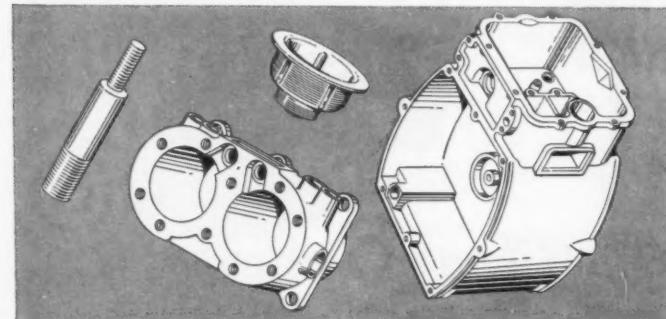
# efficiency from TOWNSEND of Hartford



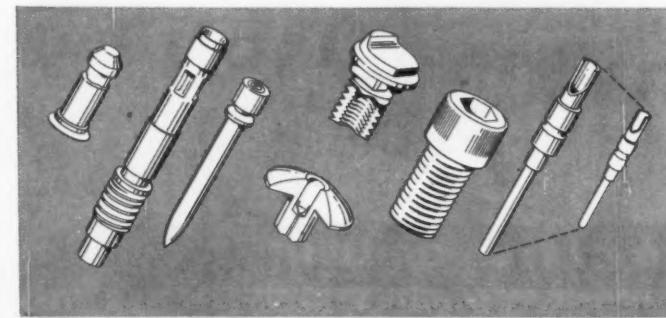
Machines for CUTTING, ferrous and non ferrous materials in regular or irregular shapes up to 20" in diameter.



Machines for MILLING, a full variety of straight and spiral keyways.



Standard and Special Machines for drilling and TAPPING . . . incorporating rotary index tables.



Hopper Fed secondary operation machines for TURNING, drilling, pointing, grooving of headed blanks.

Since 1910, the H. P. Townsend Manufacturing Company has pioneered industrial automation. Townsend's efficient mechanization of machining operation has been an important factor in *increasing production and accuracy* while at the same time *decreasing direct labor costs* in many industries throughout the United States.

Recognizing the vital need in modern industry for a *full-range integration* of automatic machines which could perform a start-to-finish cycle of machining operations, the H. P. Townsend Manufacturing Company merged under its banner *four great names* in automatic machines: The Cleveland Tapping Machine Co., Cochrane-Bly, the Machine Division of Taylor and Fenn, and The H. P. Townsend Manufacturing Co.

*The successful integration of these four companies has resulted in marked benefits to Townsend Clients:*

**Improved Production Efficiency**

**Improved Product Tolerances**

**Lower Product Production Costs**

**Reduced In-process Inventories**

**Greater Machine Versatility**

**Lower Unit Costs**

**Expanded Design-engineering Service**

It is now possible for any plant to modernize its production facilities efficiently, economically, and completely with Qualimatic machines by Townsend of Hartford. Single machines can be set up to perform single or multiple operations, or several machines—tied in with automatic materials handling—can be set up to perform a full range of machining operations.

No matter what your machining problem . . . no matter how large or small the size of your plant . . . there's a Townsend Qualimatic Machine to do the job.

Townsend's aggregate of 196 years of sound, progressive, "shirtsleeve" engineering experience can help you reduce manufacturing costs and increase production.

Send your machining and production problems to Townsend of Hartford.

**The H. P. TOWNSEND  
MANUFACTURING CO.**

HARTFORD 10, CONNECTICUT

**For men who know Drill Heads Best...  
it's always**

# **U. S. DRILL HEAD**

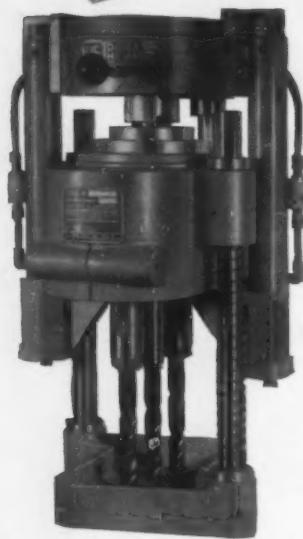
**5 to 1**



UNIVERSAL  
JOINT



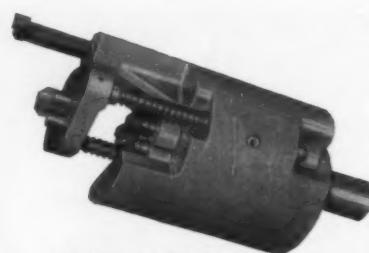
FIXED CENTER  
GREASE LUBRICATED



RADIAL SWIVEL ATTACHMENT  
WITH AIR COUNTERBALANCE



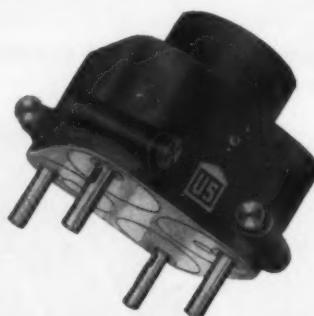
FIXED CENTER OIL CIRCULATING



TURRET LATHE TYPE



INDIVIDUAL LEAD  
SCREW TAPPER



STANDARD  
ADJUSTABLE



**DRILL  
HEAD**

**UNITED STATES DRILL HEAD CO.**

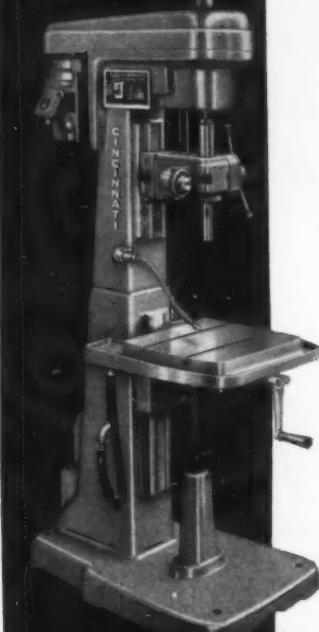
BURNS STREET • CINCINNATI 4, OHIO



... that Quality Look tells you they're

## CINCINNATI Sliding Head Drills

... and even better than  
their appearance, is  
their performance!

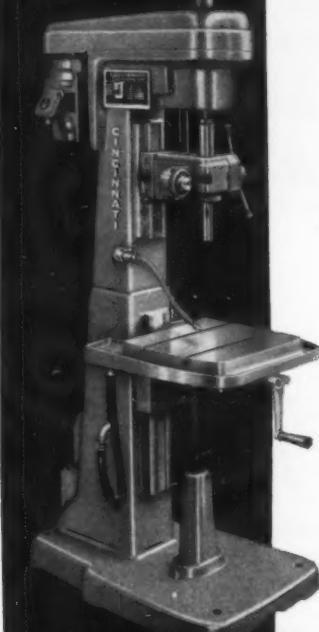


New 21" Box Column Floor Drill.  
Single or multiple spindles. 1½" drilling capacity in cast iron.

These new Cincinnati-engineered Sliding Head Drills give you the capacity, ease of operation, high accuracy and rigidity of drilling machines that *cost far more!*

Features: New geared power feeds . . . new depth dial with positive stop and automatic feed disengage . . . new massive spindle, extra rigid . . . new motor drive . . . new electrical controls . . . new unit construction of column and frame . . . new tables and bases . . . new standards of accuracy.

You'll speed up and improve your drilling machine operations by replacing all of your outmoded drills with these new, economically-priced Cincinnatis. See them and test them at your local CL&T dealer. Write direct for catalog data. Cincinnati Lathe and Tool Co., 3207 Disney St., Cincinnati 9, Ohio.



New 16" Box Column Floor and Bench Drills. Single and multiple spindles. 1" drilling capacity in cast iron.



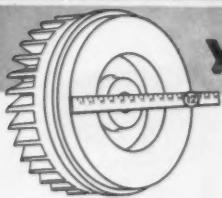
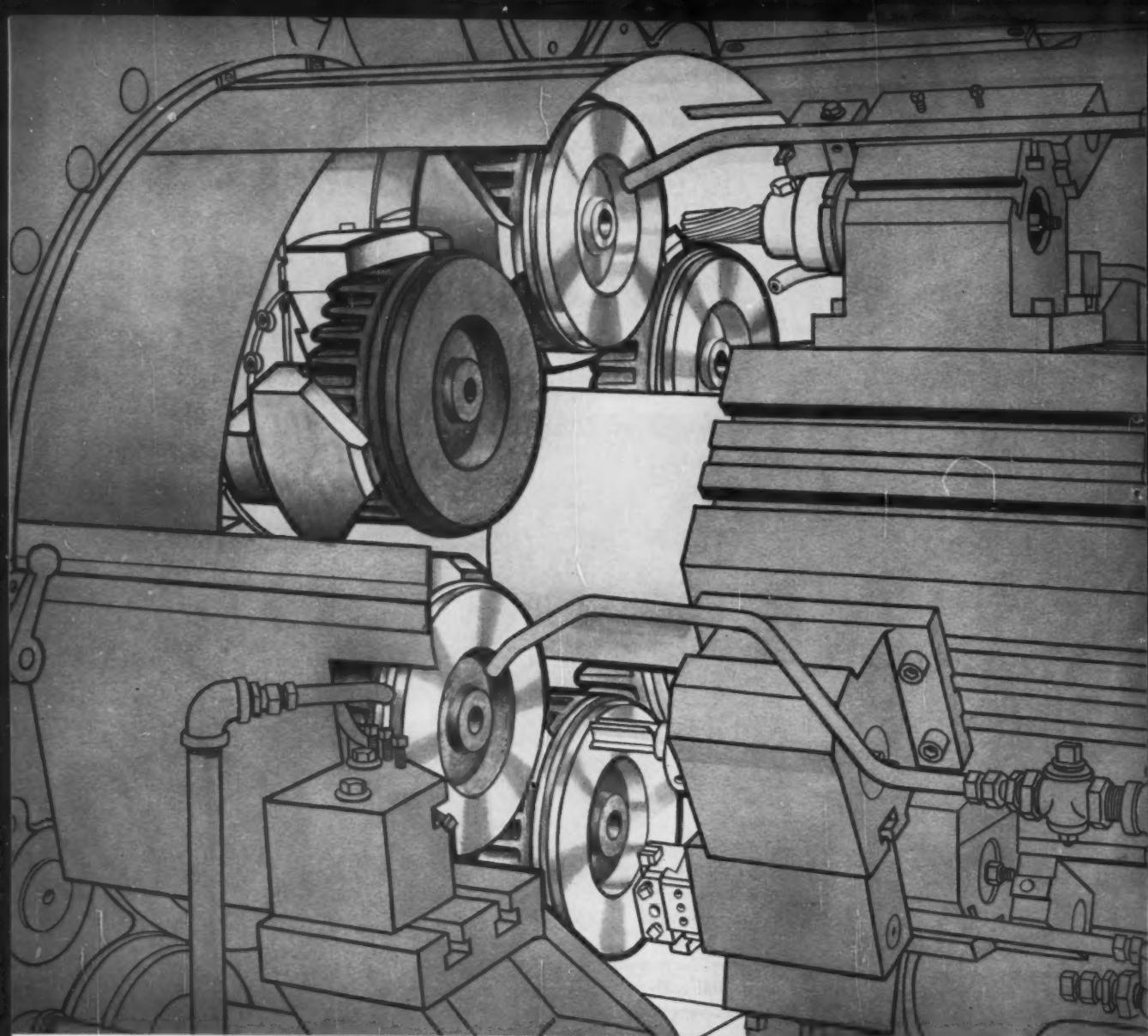
New 21" Round Column Floor Drill. Single spindle only. 1½" drilling capacity in cast iron.

center on

cincinnati lathes and drills

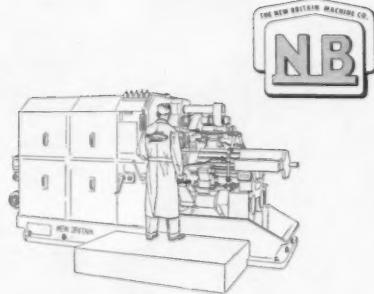
Builders of Engine, Toolroom and Fixed Gap Bed Lathes and a complete line of Drilling Machines



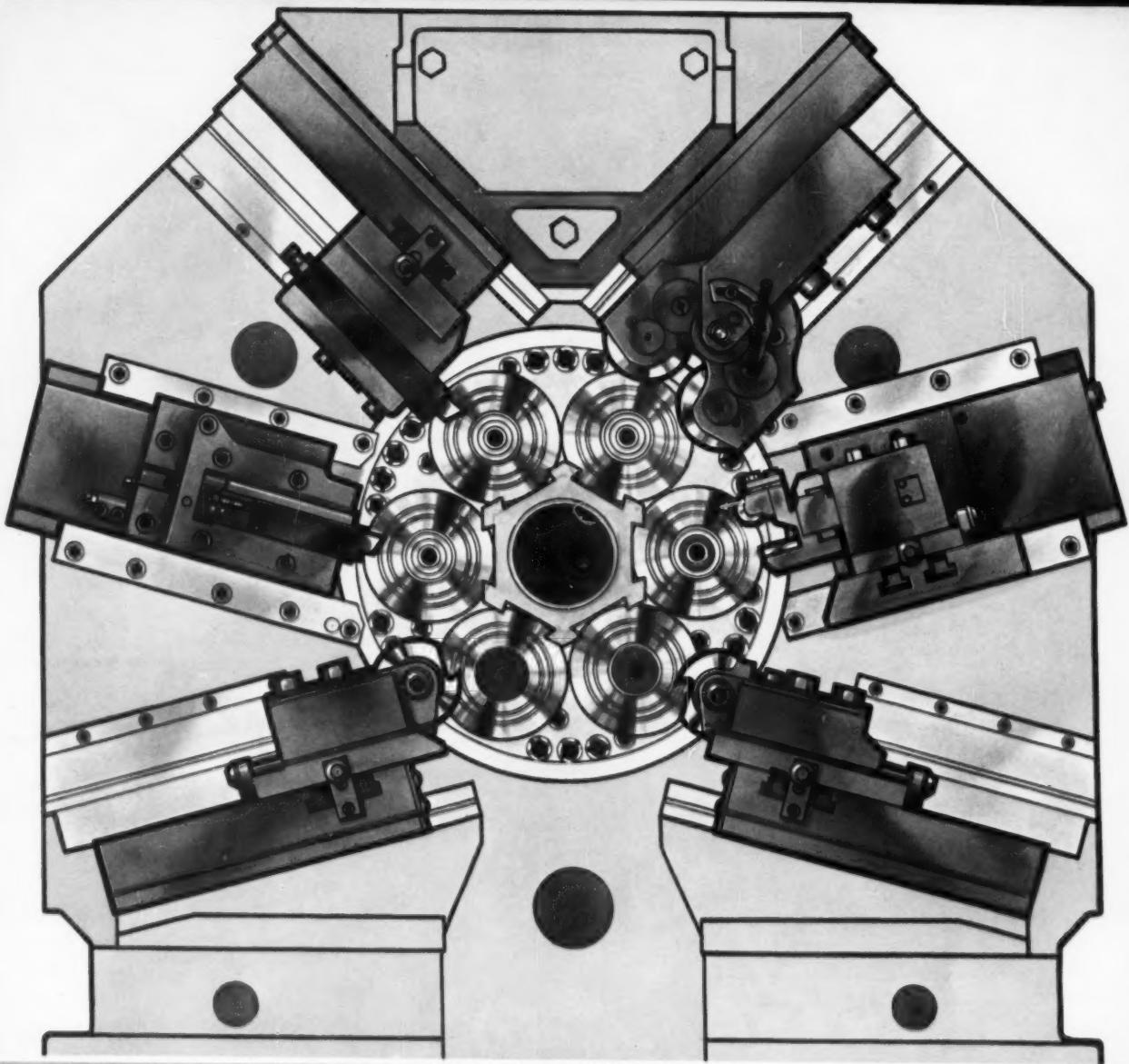


## yes! you can put it on a New Britain

Now the larger pieces which formerly necessitated slower methods because of their size can be turned out at lower cost. You can, for the first time, apply New Britain standards of productivity to larger work with the *new* New Britain four-, six- and eight-spindle chuckers . . . new, larger chucking capacities (10 inches on 8-spindle, 12 inches on 6-spindle, and 15 inches on 4-spindle models), with spindle speeds, power and ruggedness to match, and all the exclusive New Britain advantages. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

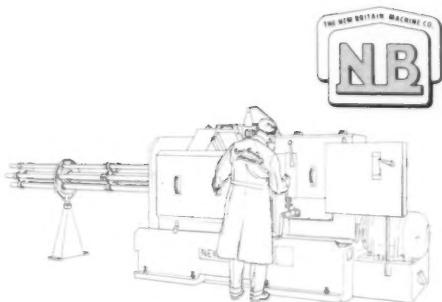


Automatic Chucking Machine

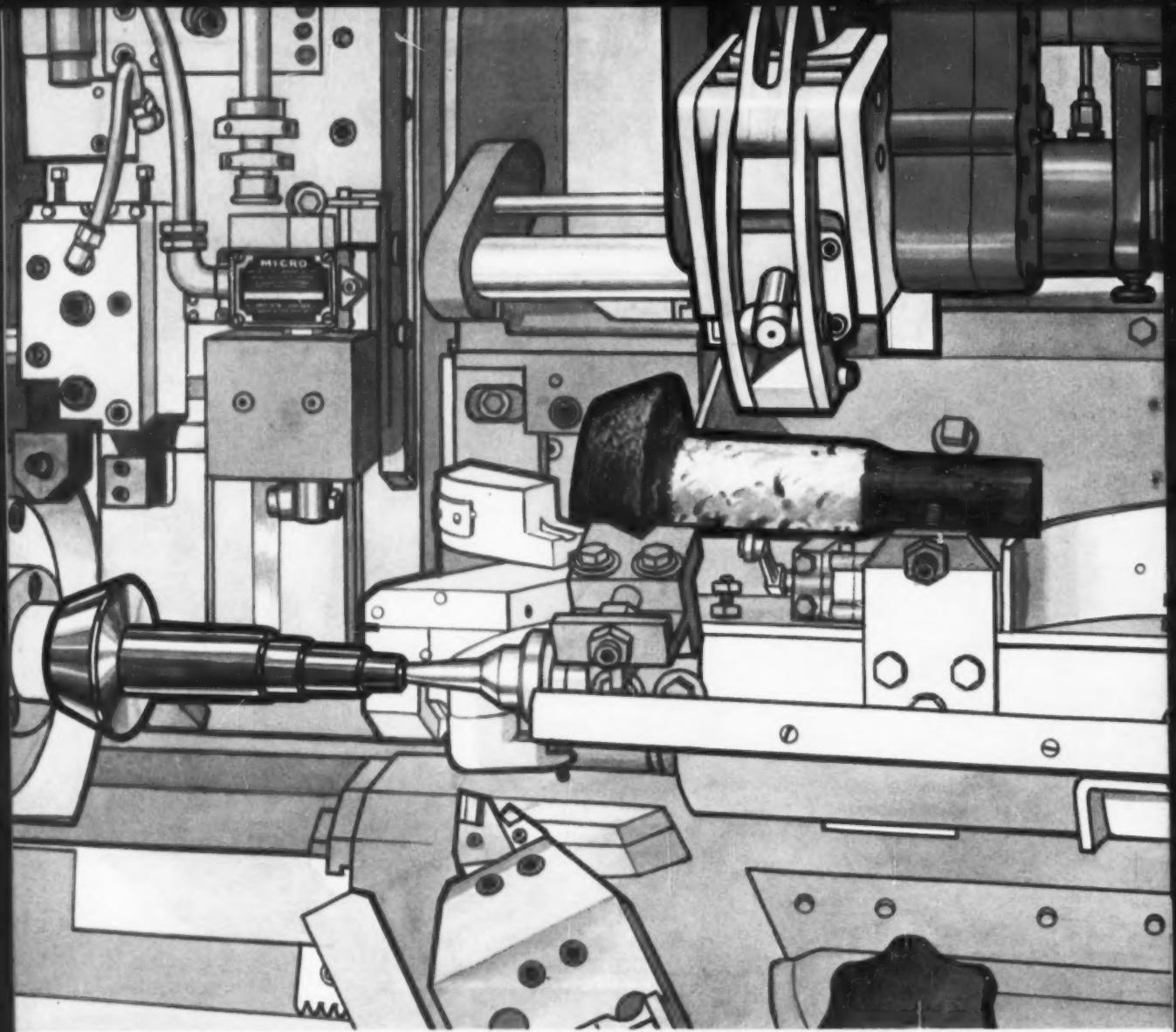


## six spindles — six cross slides

Here you see the possibilities for new flexibility of bar machine set-ups with a *cross slide in every position*. Six independent cross slides. More operations on one bar machine. Six independent radial cross slides for forming, roll threading, shaving, skiving, angular facing, knurling, hobbing and undercutting with simpler tools and attachments, through the use of cross slides. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



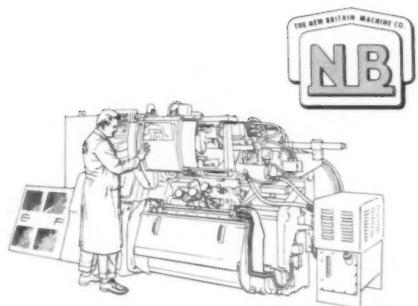
Automatic Bar Machine



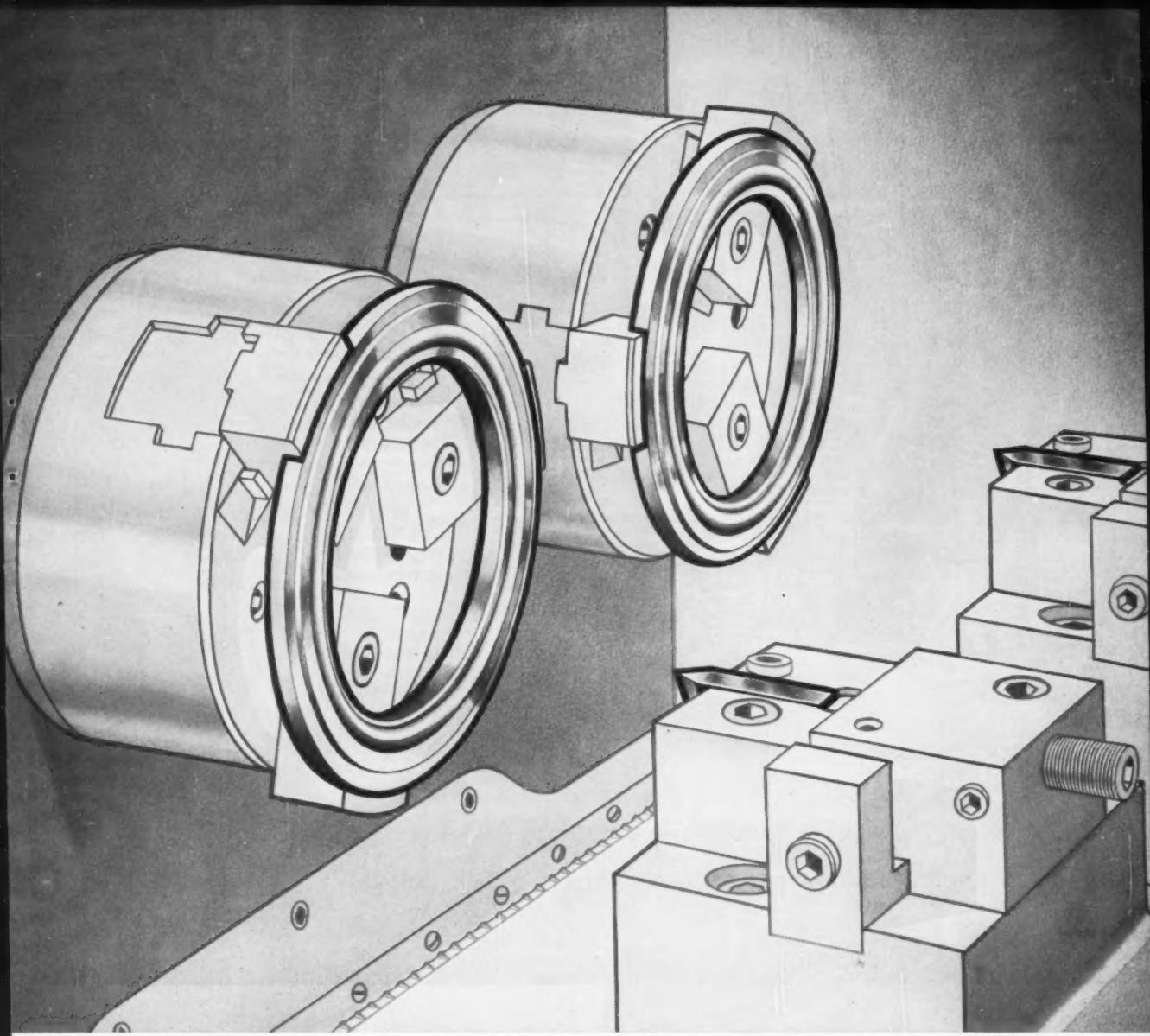
## no hands — no headaches

**A**utomatic loading of forgings, bar slugs and bar stock is a basic optional design feature of New Britain +GF+ Copying Lathes. It saves labor and makes a substantial reduction in production time per piece.

Positive, accurate loading, single point tooling and template control mean fewer headaches and larger profits on your lathe work. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



New Britain +GF+ Copying Lathe

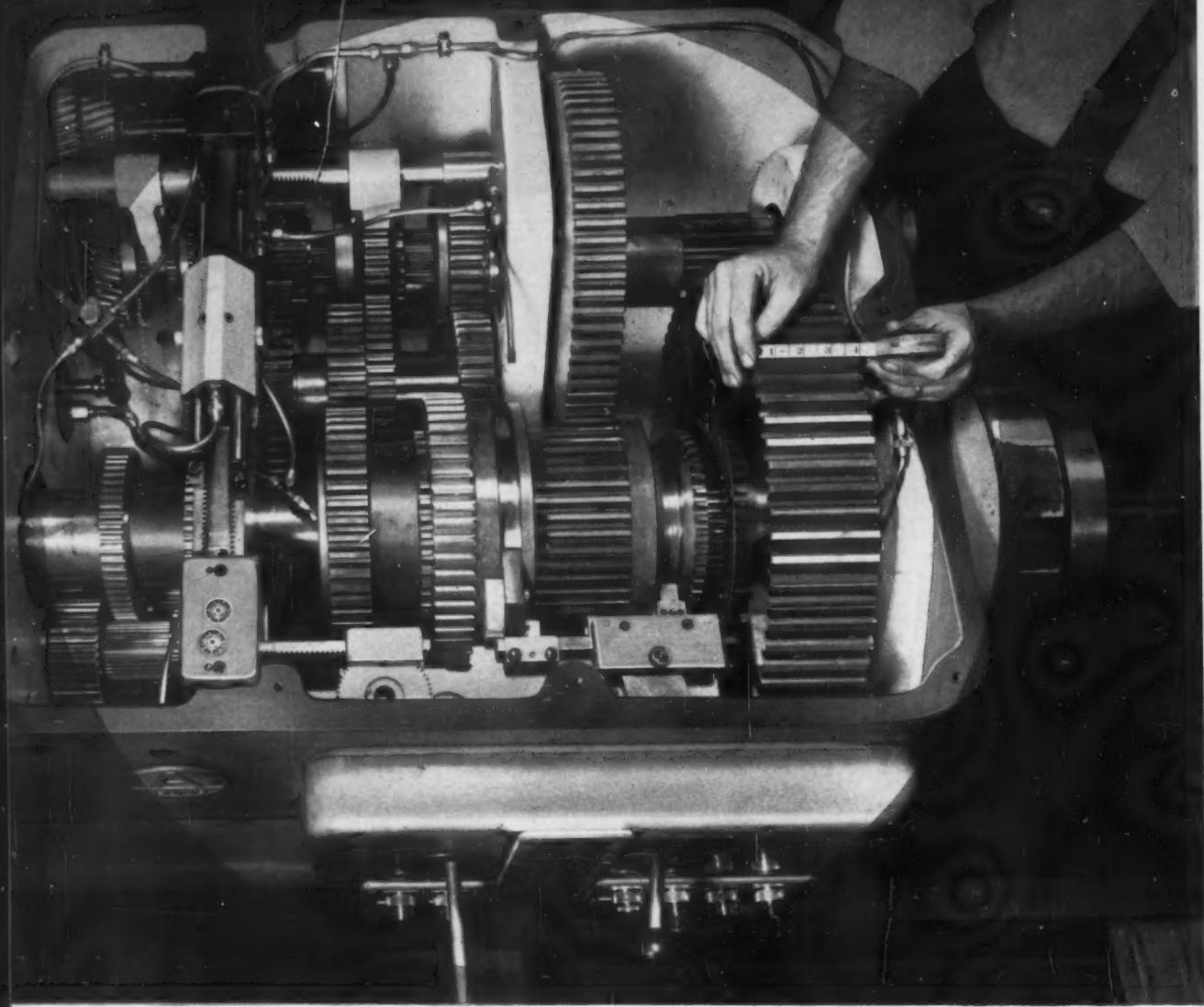


## **fewer tools to buy — set — adjust — replace**

**C**am controlled New Britain Precision Boring Machines utilize a single tool to bring several surfaces to precision tolerances — instead of a tool for every surface. Think of New Britains when you're looking for a fresh approach to lower cost per piece. Whether the part is simple or complex, you'll use fewer tools on a New Britain. Automatic gauging and tool resetting available if required. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



**Precision Boring Machine**



1

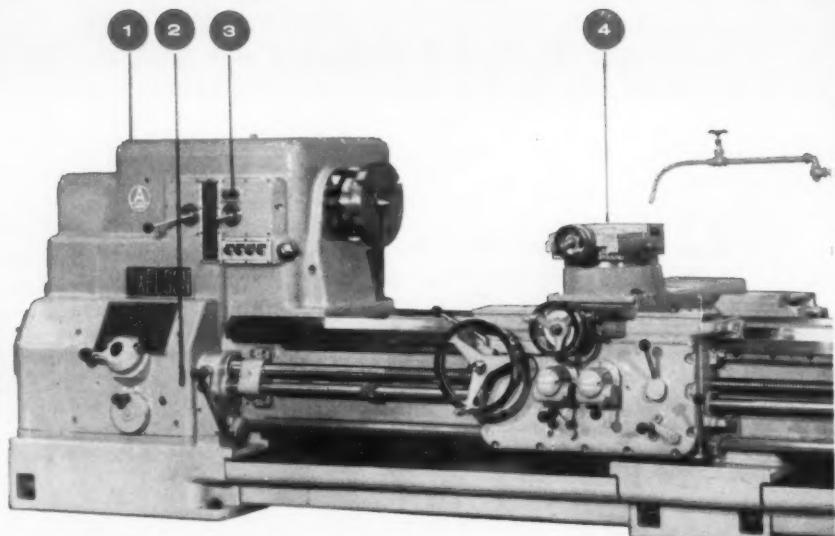
*The 24-speed headstock, designed to operate at 75 horsepower, will withstand peak loads of more than 100 horsepower. Spindle speeds are divided in true geometric progression from 6 to 750 r.p.m.*

2

*Totally enclosed gear box provides 81 feeds and 45 leads.*

3

*Two levers control speed selection, which is completely mechanical. Built-in horsepower meter is clearly readable from all operating positions.*



Axelson Model 4025 Heavy Duty Lathe.

# 100-Horse POWERFUL

Here's power-packed precision. Compare the massive 19.900"-diameter 4"-face bull gear pictured at the left - and every other part of Axelson's new 4025 Heavy Duty engine lathe - you'll find that here is the greatest productivity per dollar invested in the machine tool field today.

Swinging 40" over the bed and 25" over the cross slide, this handsome workhorse is powered by a 75-horsepower motor capable of delivering more than 100 horsepower under peak loads.

Two levers on a new totally-enclosed gear box are used in the selection of 81 feeds

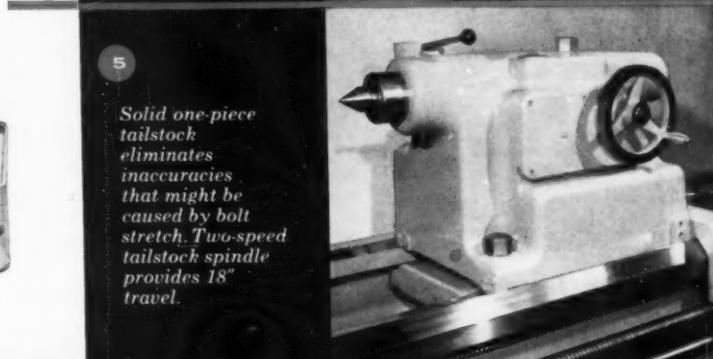
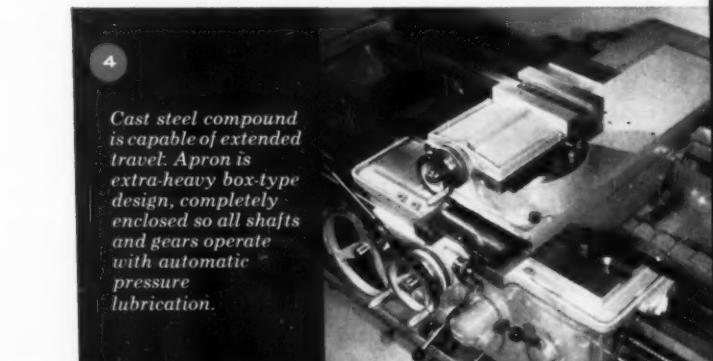
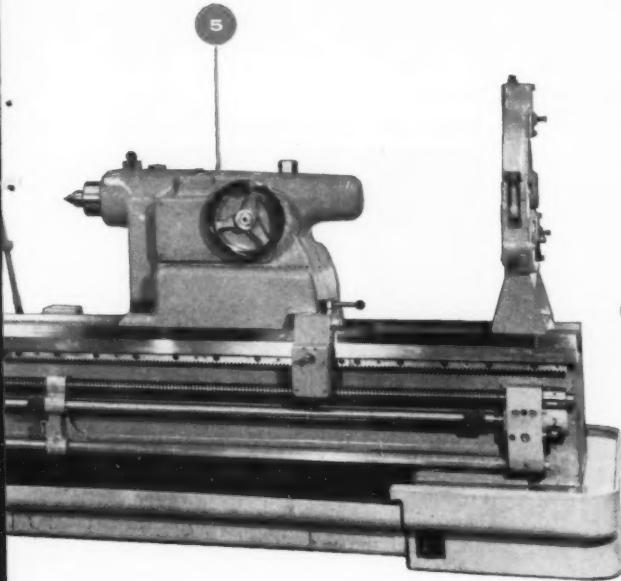
and 45 leads. Twenty-four spindle speeds are divided in true geometric progression from 6 to 750 r.p.m.

The main bed casting is girth designed with heavy longitudinal side ribs, center rib, and inverted-V cross ribs to insure the extreme rigidity required for new carbide and ceramic tooling. Replaceable hardened and ground alloy steel ways preserve original accuracy.

For complete details on the new 4025 Heavy Duty, or any Axelson lathe, call your nearest Axelson representative or write for Bulletin MM9-5504.



**AXELSON MANUFACTURING COMPANY**  
Division of U. S. Industries, Inc.  
6160 South Boyle Ave., Los Angeles 58, California



# Up to 40% higher tightening torques keep a —and only the combination of an UNBRAKO screw

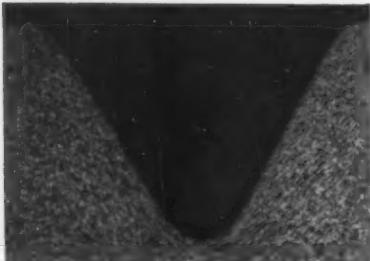
## RECOMMENDED SOCKET SET SCREW TIGHTENING TORQUES (Inch-Pounds)

| SCREW SIZE | UNBRAKO | MINIMUM     |             |                |
|------------|---------|-------------|-------------|----------------|
|            |         | SET SCREW B | SET SCREW C | DIFFERENTIAL % |
| #4         | 5       | 3.9         | 3.5         | 28             |
| #5         | 9       | 7.8         | 7.4         | 15             |
| #6         | 9       | 7.8         | 7.4         | 15             |
| #8         | 20      | 14.7        | 14.5        | 36             |
| #10        | 33      | 26.5        | 25          | 25             |
| 1/4        | 87      | 62          | 60          | 40             |
| 5/16       | 165     | 122         | 125         | 32             |
| 3/8        | 290     | 198         | 225         | 29             |
| 7/16       | 430     | 309         | 350         | 23             |
| 1/2        | 620     | 460         | 500         | 24             |
| 5/8        | 1225    | 1106        | 1060        | 11             |
| 3/4        | 2125    | 1540        | 1800        | 18             |
| 7/8        | 5000    | 3660        | 4600        | 9              |
| 1          | 7000    | 5025        | 6500        | 8              |

The High-Torque UNBRAKO socket set screw is made to withstand the highest tightening torques ever used to seat a set screw—up to 40% higher than an ordinary set screw. But to take full advantage of this UNBRAKO feature you must have a key that can apply the force required to seat it without damaging the screw or snapping the key. The High-Titan UNBRAKO hex key is designed specifically to set a High-Torque UNBRAKO so that you can be assured of full *high-torque* performance every time.

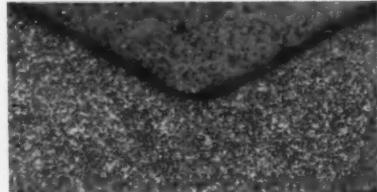
Here's why a High-Torque UNBRAKO can be seated tighter—and stay put

### UNBRAKO SET SCREW



It has fully formed threads that make the whole screw stronger. The metal is compressed into the closely knit grain structure that you see in this illustration. The grain flow follows the contour of the threads. There are no straight lines along which shear can occur. The UNBRAKO retains its flow lines even when ground down to .010 in. below root diameter. Screws with cut or ground threads lose thread form at root diameter.

### UNBRAKO SET SCREW



The High-Torque UNBRAKO has a radius in the socket corners. This eliminates the sharp corners where cracks start. It also distributes the stresses developed when tightening torques are applied. Ordinary socket screws have sharp corners which often crack when tightened even at lower torques than those recommended for UNBRAKO.

### UNBRAKO SET SCREW



### ORDINARY SET SCREW



The High-Torque UNBRAKO has a deeper socket, which gives you more purchase with the wrench. Since more wrench can be put into the UNBRAKO socket, you can set the screw much tighter. And you won't ream the socket or round the corners of the wrench.

### UNBRAKO SET SCREW

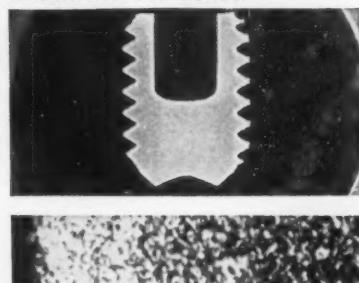


The High-Torque UNBRAKO is properly heat treated, kept clean. Its grain structure is uniform. It is free of decarburization. There's no danger of stripping the threads or shearing the point when tightening

# High-Torque UNBRAKO socket set screw tight

and key assures full high-torque performance

## ORDINARY SET SCREW



torques are applied. The ordinary screw is suffering from an overdose of decarburization; socket walls, threads and point

are full of the telltale white spots that identify it.

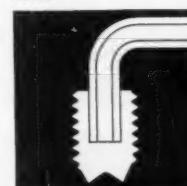
And here's why an UNBRAKO High-Titan hex key can be used to apply far more tightening torque to a High-Torque UNBRAKO socket set screw than is needed without damaging either the screw or the key.

The High-Titan UNBRAKO is not an ordinary hex key. It is a precision internal wrenching tool with high ductility, specially designed to assure full high-torque performance. It is made of special alloy steel bar stock, inspected magnetically and chemically to make sure that the material is flawless and of the specified properties. Its sides are flat and parallel. The corners,

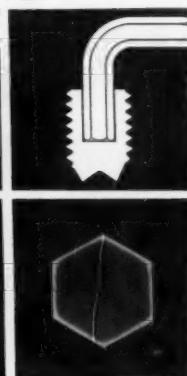
which exert torque on the inner walls of the socket, are sharp and tough. The bend is strong.

The High-Titan UNBRAKO is accurately sized across the flats and across the corners to insure snug fit and full wall contact. It won't ream or wear an UNBRAKO socket. The square cut end engages the full depth of the socket for greater tightening power. It gives you up to 25% more wrench engagement than a key with a chamfered end.

## UNBRAKO KEY

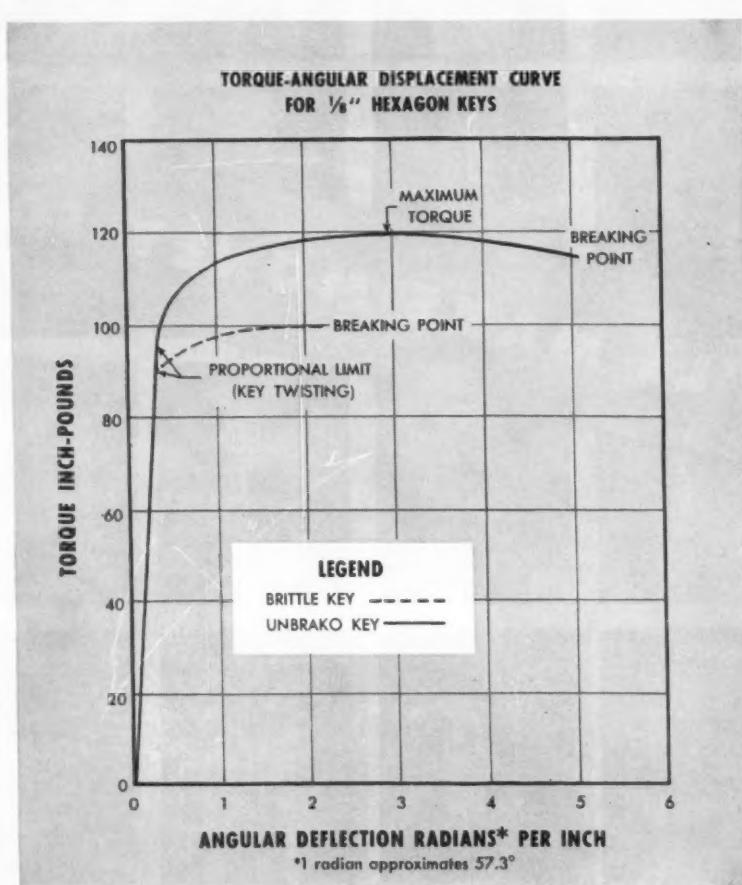


## CHAMFERED END KEY



The High-Titan UNBRAKO hex key is heat treated in modern atmosphere-controlled furnaces. The surface is casehardened without decarburization. The extra hard surface gives the key longer life. And it retains its dimensional accuracy, is tougher and more ductile than ordinary keys. This torque-angular displacement curve for  $\frac{1}{8}$  in. hexagon keys distinguishes a High-Titan UNBRAKO from an ordinary key. The High-Titan UNBRAKO has a higher yield point and a higher breaking point—you can exert a much higher torque with it without snapping the key.

Be sure you get the full high-torque performance offered only by the combination of a High-Torque UNBRAKO socket set screw and a High-Titan UNBRAKO hex key. Both products are stocked by authorized industrial distributors. Ask the one nearest you for complete information. Or write STANDARD PRESSED STEEL CO., Jenkintown 19, Pa.



We also manufacture precision titanium fasteners. Write for free booklet.

**Unbrako Socket Screw Division**

**SPS**

Jenkintown, Pennsylvania

Standard Pressed Steel Co. • The Cleveland Cap Screw Co. • Cooper Precision Products • Standco Canada, Ltd. • Unbrako Socket Screw Co., Ltd.

If for more information fill in page number on Inquiry Card, on page 255

MACHINERY, September, 1957—57

THEY'RE MAKING MONEY FOR  
THEY'LL MAKE MONEY FOR





## HYDRAULIC PRESSES

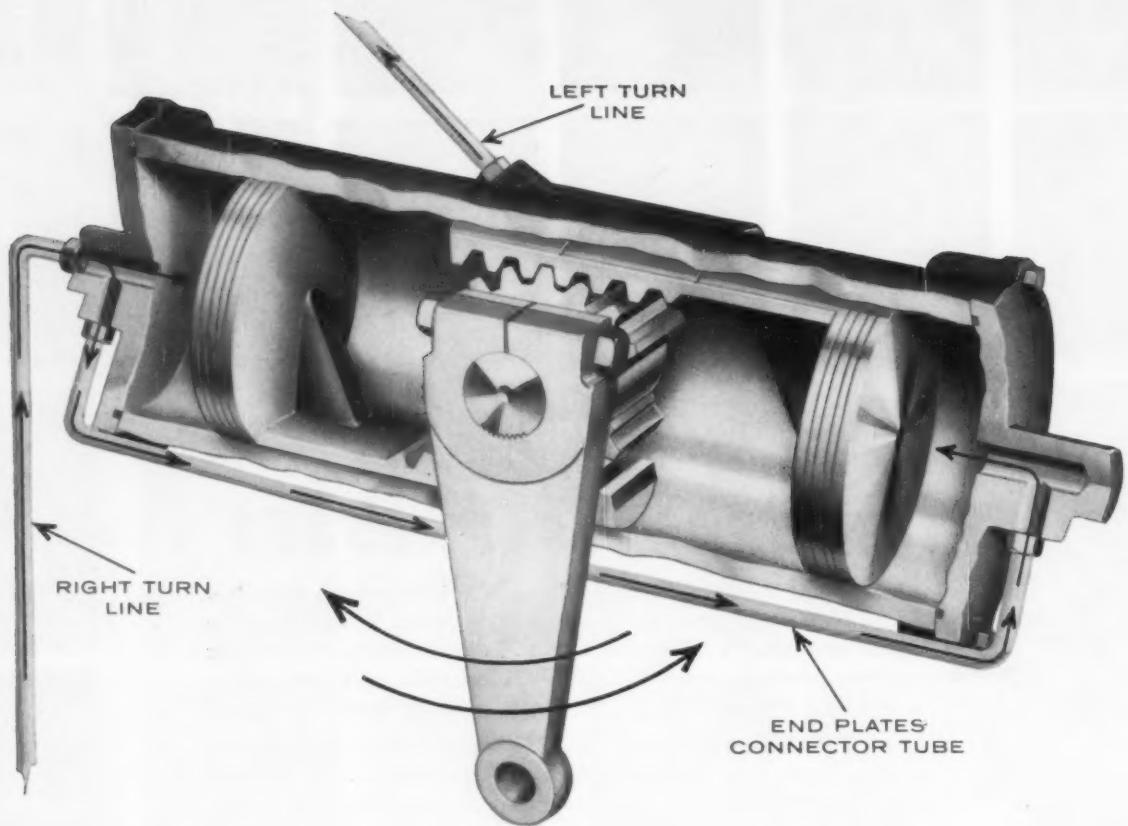
Each H-P-M deep drawing press shown here has mastered a production problem in a prominent metal working plant. In each case the results have been . . . increased output . . . fewer rejects . . . a higher quality product at lower cost. Yes, H-P-M hydraulics are the production standard for the metal stamping industry where deep draws are required!

These H-P-Ms were not "dreamed up" over night. They are backed by a press builder with 80 years of hydraulic experience . . . a company which has pioneered such important hydraulic press features as . . . the self-contained press . . . FASTRAVERSE high speed operation . . . closed circuit hydraulic system . . . reversible, variable delivery radial pumps . . . complete automatic press cycle controls . . . variable pressure hydraulic blankholder and die cushion . . . pressure reversal . . . in fact, every known modern development now employed in hydraulic presses.

You capitalize on this "know how" when you specify H-P-Ms. You name the draw job . . . we will choose an H-P-M from among the many hundreds of designs which have already been built and proven. A nearby H-P-M engineer is available to help you. Write today.

### THE HYDRAULIC PRESS MANUFACTURING COMPANY

A DIVISION OF KOEHRING COMPANY  
Marion Road • Mount Gilead, Ohio, U.S.A.



## **Now...a new kind of Power Cylinder to help you cut costs**

THE new rotary motion Thompson Power Cylinder provides versatility of application, ease of installation, compactness and efficiency certain to solve many design and manufacturing problems. These features can cut your costs by simplifying production. It is now in use in a leading make of heavy-duty trucks.

Requiring a minimum of space, the Thompson Power Cylinder can be operated wherever hydraulic or pneumatic pressure is available. Operating from 600-1000 psi, at 700 psi it delivers approximately

26,000 inch pounds torque output. These parameters can be varied to obtain a custom installation. Also, over-running clutches, sprockets, gears, chains, etc., are easily adapted to the output shaft to further increase its versatility.

Precision engineered, the Thompson Power Cylinder is as dependable as it is versatile. You can count on a long, continuous, trouble-free life.

To learn more how the Thompson Power Cylinder can save you money in design, manufacture and installation costs, write for our free book-

let. Described are many of its diverse uses and additional benefits. Mail to Thompson Products, Inc., Michigan Division, 34201 Van Dyke Avenue, Warren, Michigan.

**You can count on**

**Thompson**  
**T P Products**

**Michigan Division:**  
Warren and Portland

*This Month's*  
**GEAR PIX**

**NEW MICHIGAN ORIENTOR  
MAKES BACK-TO-BACK  
HOBBING A NATURAL**

Even on parts like this flanged pump gear, you can get multiple-spindle capacity from your high-speed Michigan single-spindle hobber. The new Michigan orientor reverses every other gear and thus positions two parts back-to-back as they go into the gear hobber. Total loading time for the fully automatic cycle is only four seconds for the two gears. Ask for details on the No. 1445 hobber.

**AUTOMATION BOOSTS  
SHEAR-SPEED RATE TO  
180 PER HOUR**

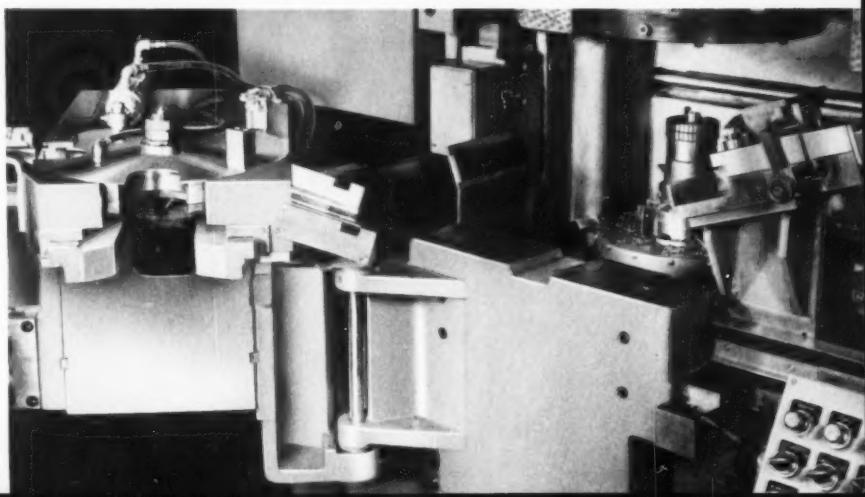
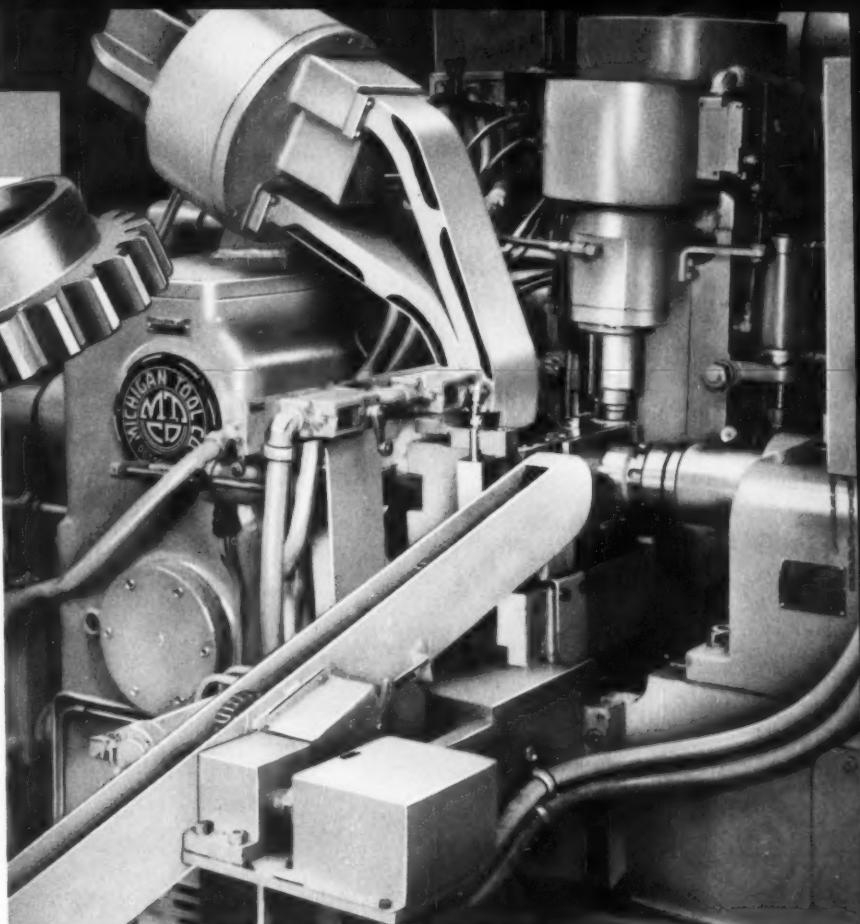
Automatic two-at-a-time parts loading and unloading has this Model 1853 Shear-Speed running at 100% efficiency producing 180 clutch hubs per hour. The work? A 36-tooth involute spline on a face width of .580 inches with a diametral pitch of 9.750. Pressure angle is 14½°. Parts are automatically positioned in pairs, fed, advanced, indexed 90° and picked up on a hydraulic arbor. Loading time is 8 seconds. Automatic cutting cycle for both parts is 32 seconds.

**AUTOMATION SWINGS  
CLEAR FOR TOOL  
CHANGE ON SHEAR SPEED**

Any interference of automating devices with tool changes is avoided on this Shear-Speed with a swing-out arrangement. The hinged mechanism swings the loader, index table and index slide completely clear of the machine. Pin-locked stops assure positive alignment.

**MICHIGAN TOOL  
COMPANY**

7171 E. McNICHOLS RD. • DETROIT 12, MICH.  
IN CANADA: COLONIAL TOOL CO., LTD.



*This Month's*  
**GEAR PIX**

**THESE 3 ROTO-FLOS  
WILL SPLINE 2½ MILLION  
AXLE SHAFTS IN 1957**

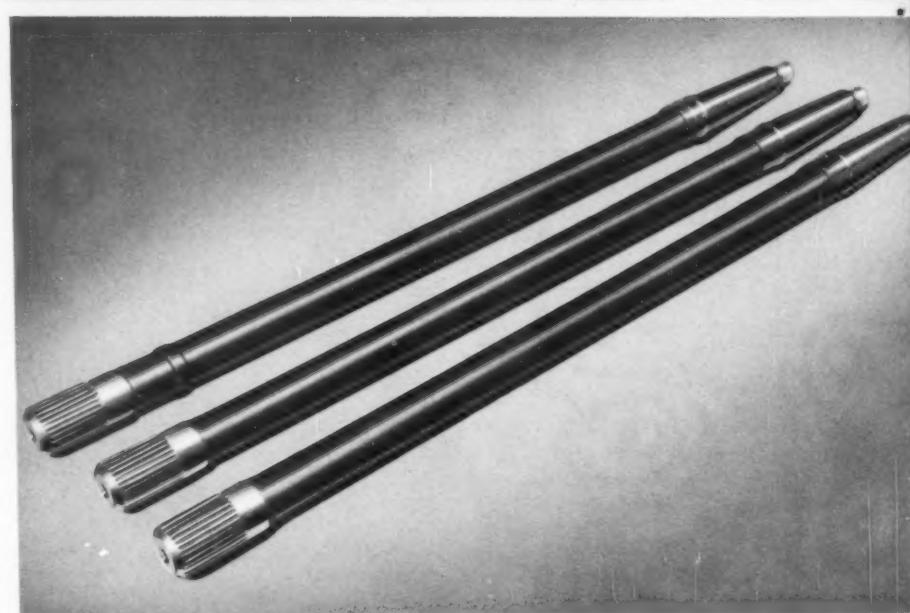
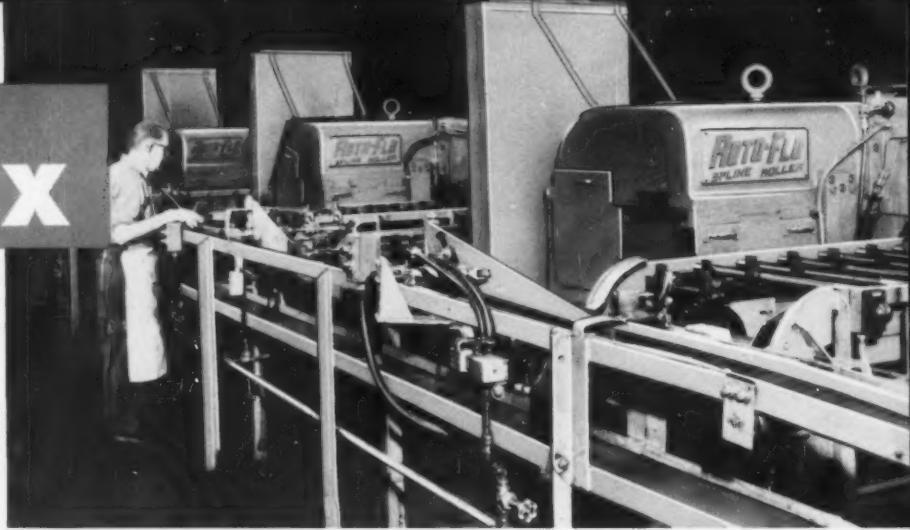
At a nominal tool cost, these 3 machines are producing all the splines on all the rear axle shafts for 5 lines of cars.

Here is the story:

No. of Roto-Flos.....3  
No. of operators.....1  
Output rate.....1080/hr.  
Surface finish...5 microinches RMS  
Shafts per grind.....123,000  
Tool change time.....20 minutes  
Outside dia.....1.290 in.  
No. of teeth.....30  
Spline length.....1.62 in.  
Diametral pitch.....24/48  
Pressure angle.....30°

\* \* \*

Roto-Flo is a development of Michigan Tool Company, the nation's gear production headquarters. The Roto-Flo process cold forms toothed and grooved parts—gives you a superior product in a matter of seconds instead of minutes. Roto-Flo machines will lower your capital investment, reduce direct labor costs, cut floor space needs, drop upkeep to the minimum, give you amazingly high tool life. For the story on Roto-Flo ask for "Chipless Production" (Bulletin RF-55). Write for your copy today.

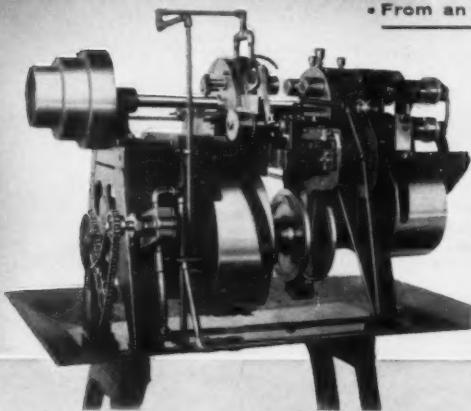


**MICHIGAN TOOL  
COMPANY**

7171 E. McNICHOLS RD. • DETROIT 12, MICH.  
IN CANADA: COLONIAL TOOL CO., LTD.

# Thanks, Mr. Keebler...

You have said it better  
than we could!



First successful multiple-spindle automatic—the granddaddy of all of today's "multiples"—developed and built by National Acme in 1893.

- History has recorded the machine tool development about which Mr. Keebler writes as the direct prototype of present day Acme-Gridley Multiple Spindles—in fact, it's the granddaddy of all of today's "multiples".
- Since the inception and development in 1893 of the first successful Four Spindle Automatic Screw Machine, National Acme has extended the inherent circumferential automation principle of its basic design to six and eight spindle machines. These machines have set the pace with which to meet, head-on, industry's need for greater and less costly production.
- Knowing that the future will make ever greater demands on circumferential automation, National Acme will continue to expand applications for Multiple Spindle Automatics. Who knows? some day the line may include not only 4, 6 and 8 spindles, but 12 and 16 spindle machines as well.

...  
this tubing annually that the price

• From an editorial in April, 1957 AUTOMATION

by JAMES C. KEEBLER, Associate Editor

Those who think of automation only in terms of production techniques developed since Harder first uttered the magic word *Automation* are thumbing right past a few useful rules. If we aren't careful these newly trained manufacturing engineers will be overlooking a few tricks that have been in the trade since Hector was . . .

Overpublicizing the new developments might overshadow the fact that the methods developed long ago fit the pattern of present-day automation techniques and therefore should not be overlooked in evaluating possible production processes.

A case in point is the automatic screw machine used on these bearing rings. This machine development was placed on the market in the 1890's and incorporated such sound basic automatic machine thinking that it remains primarily the same in principle in its 1957 model.

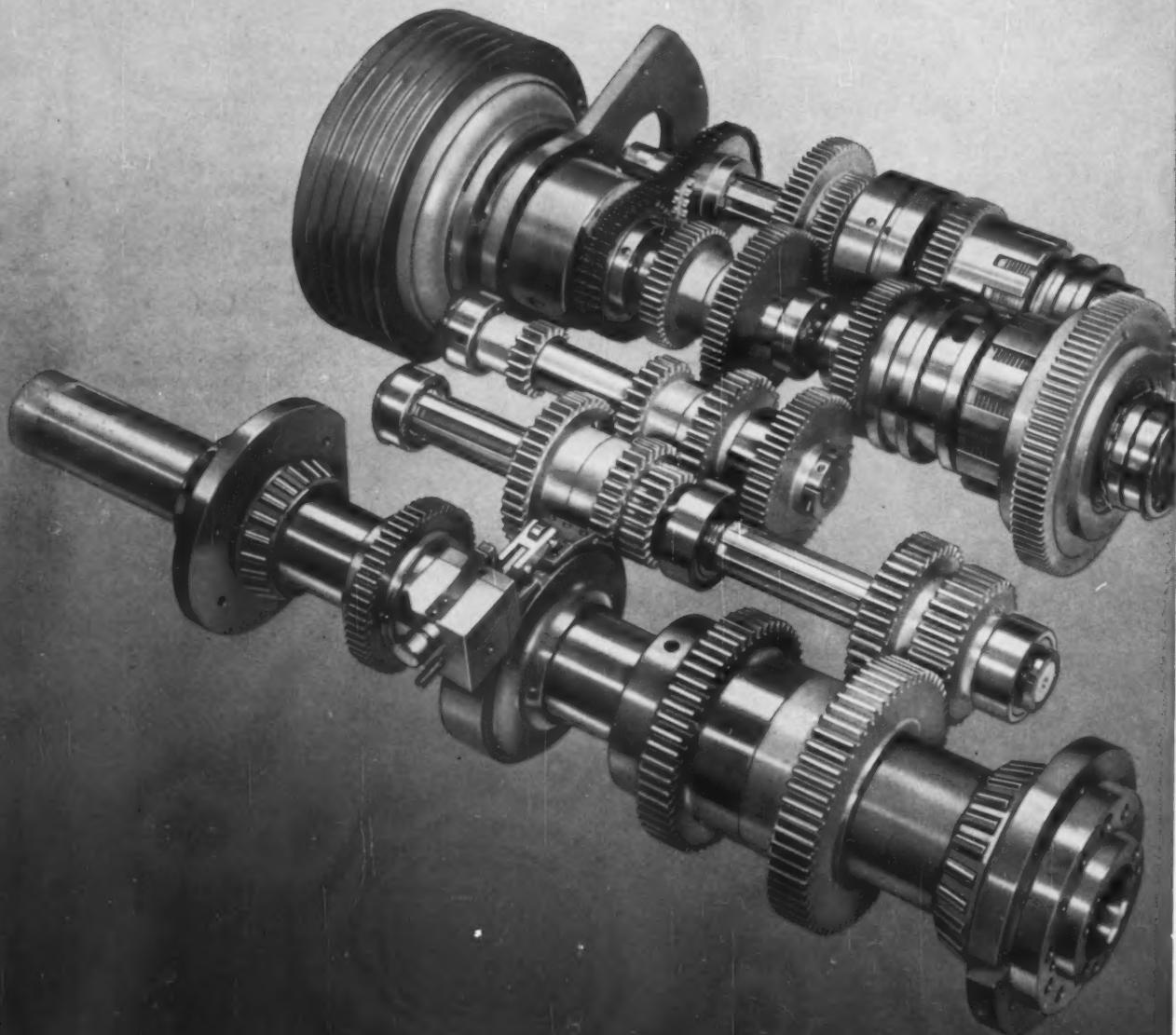
On these machines are performed in succession and without manual attention virtually all of the circular machining operations required on ball bearing rings. This is automation. Just because the technique is not new is no reason why it should not be given its just place in the galaxy of automation studies.

# National Acme

THE NATIONAL ACME COMPANY, 179 E. 131ST ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N. J., Chicago 6, Ill., Detroit 27, Mich.

*The power reserve and range of speeds*

# YOU'LL NEED FOR THE



# TOOLS OF TOMORROW

## New GISHOLT MASTERLINE SADDLE TYPE TURRET LATHE

**WANT MAXIMUM OUTPUT AND ACCURACY** from today's carbide tools—with an ample reserve of power and speeds to meet tomorrow's tooling requirements?

That's what you'll get—*now*—from this powerful, rugged Gisholt MASTERLINE Saddle Type Turret Lathe. Prime example of this machine's advanced features is the rugged Headstock Gear Train, shown at the left. Here, you can get 24 different forward speeds—all from a *single-speed* motor. This means you get *full power all the time*—a critically important feature for those heavy cuts at punishing feeds.

But that's not all. To give you maximum performance from this powerful gear train, Gisholt designers have backed it with faster speed changes through the Hydraulic Speed Selector (effortless speed shifts without waiting or computing); a hydraulically operated Hi-Lo speed change in a 6:1 ratio (without stopping the spindle or shifting gears); and a new Self-Adjusting Electric Clutch and Brake (smooth, fast starting and stopping, plus more accurate inching of the spindle).

Ask your Gisholt Representative to give you the complete facts. Why not call him today?



ASK FOR complete set of Gisholt MASTERLINE Saddle Type Turret Lathe Bulletins.

**GISHOLT**  
MACHINE COMPANY



Madison 10, Wisconsin, U.S.A.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • PACKAGING MACHINES • MOLDED FIBEGLAS PLASTICS

# Newest, most versatile, most complete

O. S. Walker, the originator of magnetic chucks, now offers a completely new, full line of chucks with the most permanent magnets ever produced — they're ceramic\* — with many times the coercive force of alloy magnets. The face is *all* steel, with no soft insulating material. These chucks weigh only half as much as conventional permanent chucks, thus minimizing reciprocating table inertia.

Their low, low height gives more machine capacity than ever before.

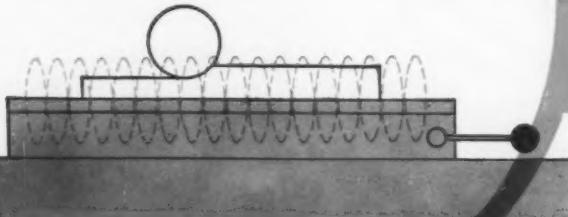
Fine pole divisions give maximum holding on all types of work pieces. All magnetic fields are neutralized to prevent magnetization of machine table or ways. *Write for details.*

\*Patent applied for

## ...perfect for milling too!

Exclusive construction† makes these new chucks perfect for milling or planing. Cutter is constantly *demagnetized* as it progresses — no more fouling of cutter and work with chips!

Let us demonstrate this amazing contribution to industry.



†O. S. Walker magnets are polarized horizontally (conventional construction has magnets polarized vertically).

New  
No. 824



# O. S. WALKER

# *line of permanent magnetic chucks!*



**COMPANY, INC.**  
**WORCESTER 6, MASSACHUSETTS**

**\$7200 per month saving by  
large automotive plant after switching to**



**DASCO D-20**

**HEAVY-DUTY SOLUBLE OIL**

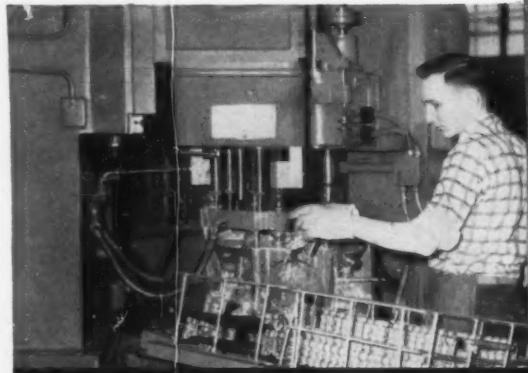
An actual saving of \$7200 per month, including labor costs, has been reported by a large automotive transmission plant since switching to Stuart's Dasco D-20—the first truly heavy-duty soluble oil formulated and priced for general application!

**ONE OIL FOR 365 DIFFERENT MACHINES**—This carefully engineered compound eliminates cutting oil confusion—drastically reduces the number of cutting fluids needed in your plant. This plant uses economical Dasco D-20 in standard mixtures on 365 different machine tools—reducing cutting oil inventory . . . saving service time and cutting oil costs . . . minimizing chance of error—yet taking advantage of all lubricating and cooling properties you expect from a heavy-duty soluble oil.

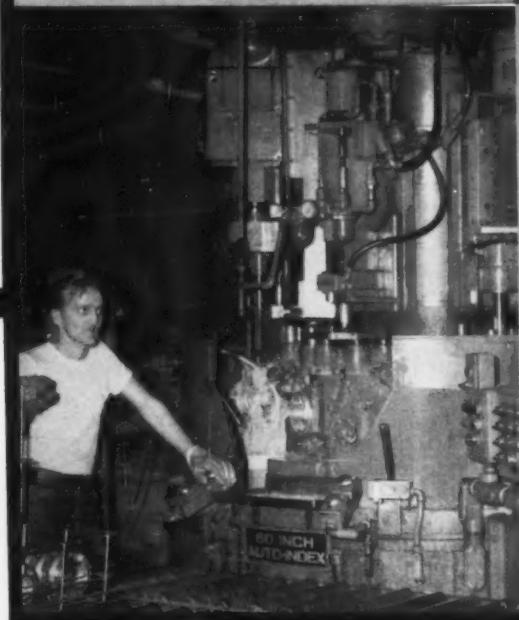
**RANCIDITY ELIMINATED**—This user reports that Stuart's Dasco D-20 stays sweet longer—even after long shutdowns. Rancidity is actively resisted by a special germicide additive, the best of a very few germicides that remain effective in the presence of soaps. Stuart's Dasco D-20 has superior wetting ability—remains effective when mixed with water.

### For Cutting and Grinding

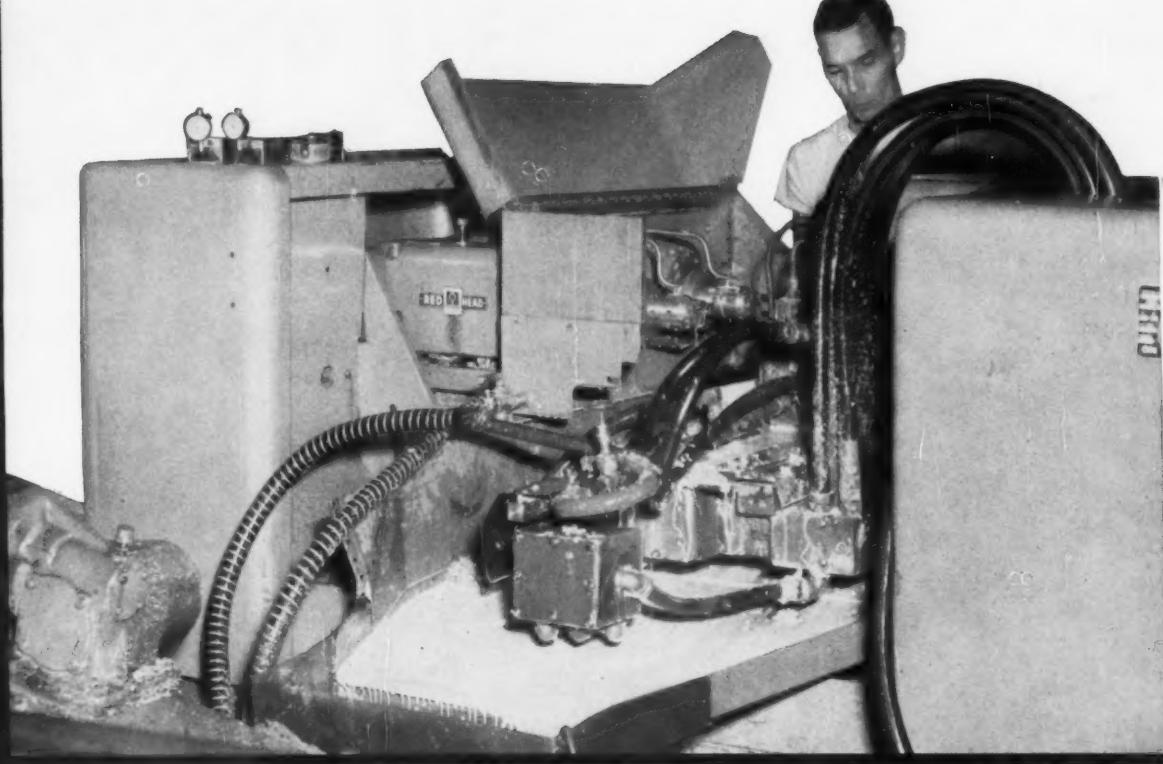
Stuart's Dasco D-20 maintains or improves efficiency of your cutting and grinding operations. A real heavy-duty emulsifiable oil, it forms a tough, thin film between the cutting tool and the work . . . reducing friction and preventing excessive heating. A wide variety of tough metal-cutting operations, including certain types of broaching, can be done with this one low-priced compound. A lean mixture for grinding enables you to take full advantage of improved wheel bonds. Properly applied, it allows you to use high-unit pressure for maximum stock removal . . . keeps wheels open and free-cutting . . . prevents heat checking.



Chips settle faster with Stuart's Dasco D-20, so you have a clean compound in your machine at all times. You get a better finish . . . cooler cutting and grinding.



You can use low-priced Stuart's Dasco D-20 for reaming, boring, drilling, facing, chamfering, milling, tapping, threading, broaching, surface-grinding, and high-speed carbide tool machining.



## **First low-priced heavy-duty soluble oil with both additives: active germicide and E. P. base**

Stuart's Dasco D-20 is the first low-priced soluble oil to offer you both a special anti-rancidity germicide and an extreme pressure base oil additive with high anti-weld and lubricity characteristics. Carefully balanced, high-quality emulsifying agents provide high-grade cooling properties . . . unusual stability for longer life. This

multi-purpose, heavy-duty soluble oil gives you ideal characteristics for high-speed machining with carbide cutting tools . . . upgrades finish and tool life on tool steel applications. Stuart's Dasco D-20 has superior wetting ability . . . avoids rust . . . mixes easily . . . keeps machines and parts clean . . . and is preferred by operators.



Phone your  
Stuart Service Center

Arrange now to test Stuart's Thermex 33 Hot Die Lubricant on your difficult forging and drawing operations.

|                        |                   |
|------------------------|-------------------|
| DETROIT, MICH. ....    | Tyler 7-8500      |
| CHICAGO, ILL. ....     | Bishop 7-7100     |
| HARTFORD, CONN. ....   | Jackson 7-1144    |
| CLEVELAND, OHIO. ....  | Prospect 1-7411   |
| PHILADELPHIA, PA. .... | Devonshire 8-6100 |
| TORONTO, CANADA. ....  | Oxford 9-9397     |

Representatives in all principal cities

SINCE 1865

**D. A. STUART OIL CO., LIMITED**

2729 South Troy Street, Chicago 23, Illinois

**CANADIAN D. A. STUART OIL CO., LIMITED**

3575 Danforth Avenue, Toronto 13, Ontario



**METALWORKING  
LUBRICANTS**



**MEMORANDUM**  
FROM ENGINEERING DEPARTMENT

Attn.: C. P. Smith  
Design Group

Vibrating Conveyor #3 broke down after approximately  
17,000,000 cycles of operation. Spring return lever  
failed, due to low fatigue resistance. Flexloc locknuts  
worn, but still locked in original positions.

Recommendations:

- 1) Redesign lever to give increased strength in center section.
- 2) Eliminate side play in lever motion which has been causing excessive wear in related parts.
- 3) Continue use of Flexloc locknuts.

B.F.W.

## Why designers specify FLEXLOC self-locking nuts

Where products must be tough . . . must stand up under vibration, shock and abuse . . . designers specify rugged, reliable, precision-built FLEXLOC self-locking nuts as fasteners.

### HERE'S WHY:

FLEXLOC locknuts are strong: tensile strengths far exceed accepted standards. They are uniform: carefully manufactured to assure accurate, lasting spring tension in the flexible locking collars. And they are reusable: rough screw threads,

We also manufacture precision titanium fasteners. Write for free booklet.

repeated removal and replacement, frequent adjustments will not affect their locking life.

Standard FLEXLOC self-locking locknuts are available in a wide range of standard sizes and materials, to meet the most critical locknut requirements. Your authorized industrial distributor stocks them. Write us for complete catalog and technical data. Flexloc Locknut Division, STANDARD PRESSED STEEL CO., Jenkintown 19, Pa.

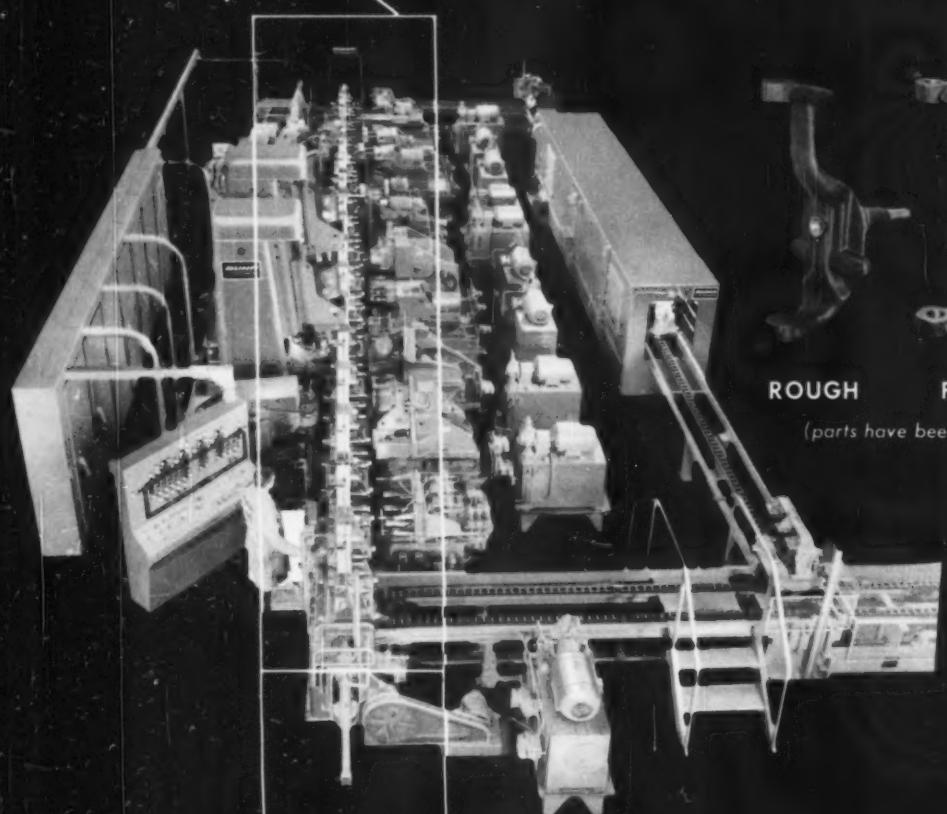
STANDARD PRESSED STEEL CO.

**FLEXLOC** LOCKNUT DIVISION

**SPS**  
JENKINTOWN PENNSYLVANIA

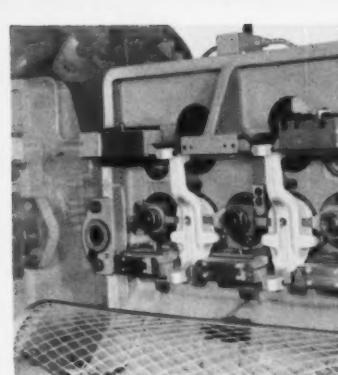


**BUHR ECONOMATIC** sets prece



ROUGH      FINISH      ROUGH      FINISH

(parts have been ground and qualifying pads broached)



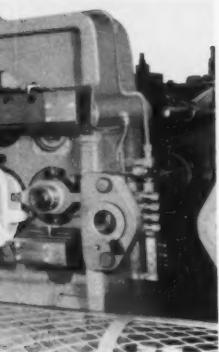
## operations

- (4) milling, (8) drilling,
- (2) rough taper-reaming,
- (2) finish taper-reaming,
- (2) spot facing, (5) chamfering,
- (1) tapping, (1) threading,
- (1) steel-brushing and (3) probing

- automatic probe and
- special Buhr sectional-
- standard and special p
- spindles arranged for
- hardened and ground
- central-mist lubricatio
- individual push-button

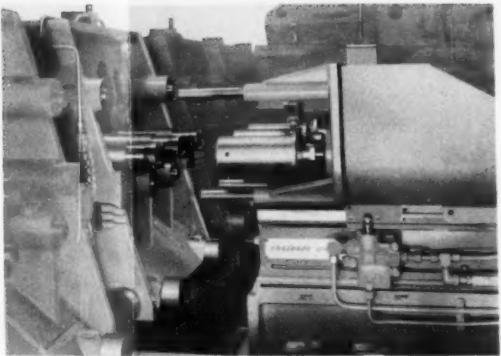


**edent** by performing 29 operations on two steering knuckles every 32½ seconds!

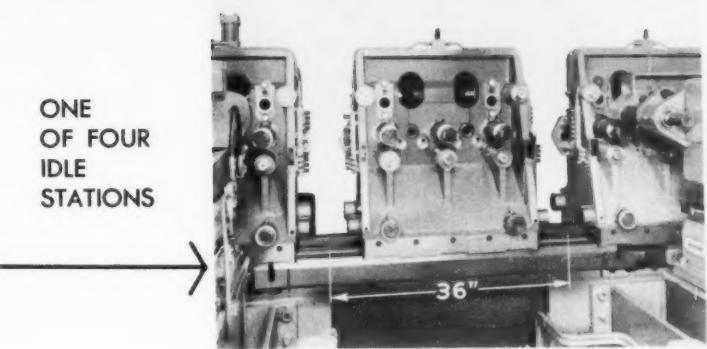


PARTS IN CLAMPED POSITION

INDIVIDUALLY-CONTROLLED TORQUE WRENCHES



ONE OF FOUR IDLE STATIONS



## standard features

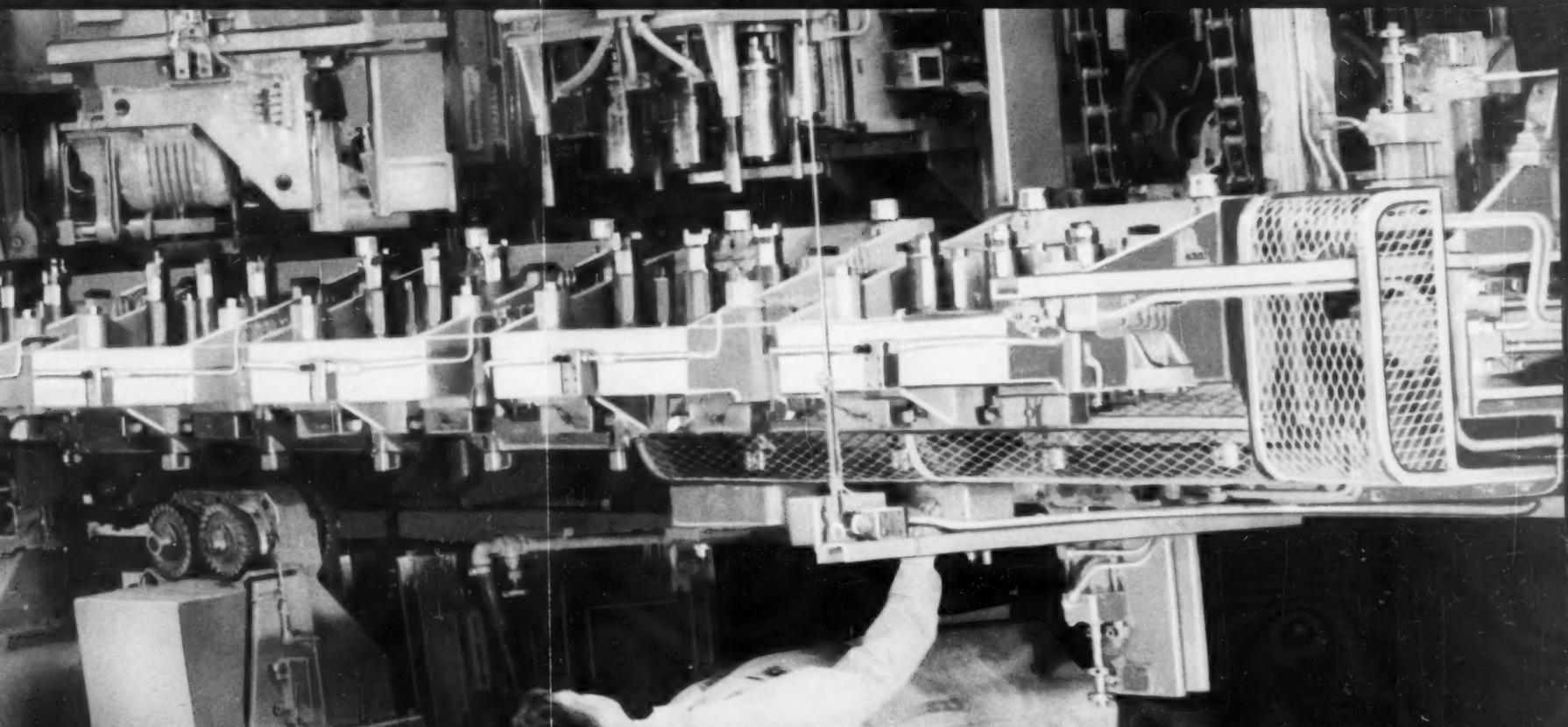
and blow-out before tapping  
ional-base construction to facilitate future part changes  
cial parts interchangeable for ease of maintenance  
for pre-setting of cutting tools  
und steel ways  
cation on spindle heads  
utton stations on feed-units

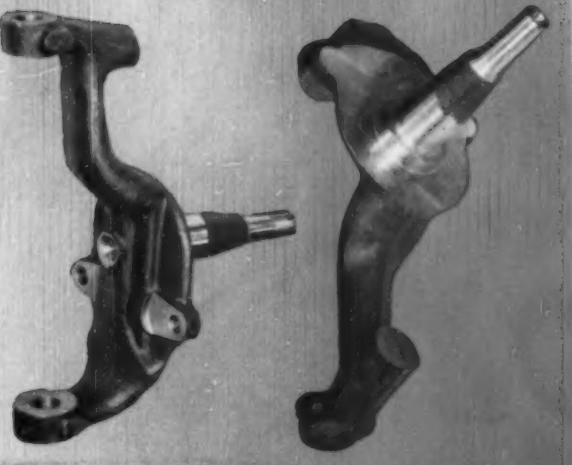
- J.I.C. Standards throughout
- lube-fault alarm system
- automatic lubrication of all moving parts
- positive pallet-clamping

**BUHR** MACHINE TOOL CO.<sup>®</sup>

ANN ARBOR, MICHIGAN

Solidly Engineered • Precision Built • for World's Leading Manufacturers

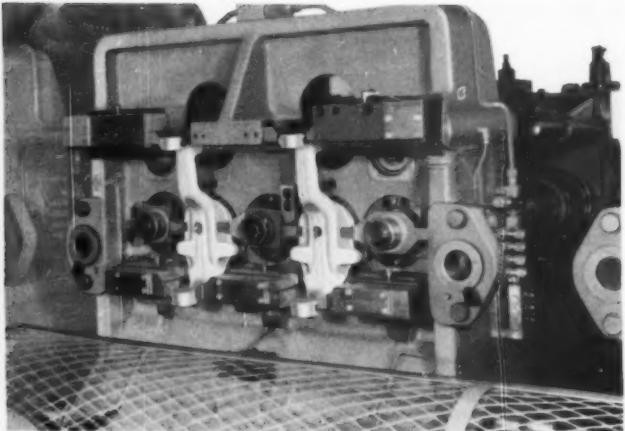




### automotive steering knuckle

(TWO VIEWS, SAME PART)

with fixtures like this...



built to  
hold the parts  
rigidly  
without  
distortion

setting the pace  
in the  
performance of  
complex operations  
in modern



# ECONOMATION

"ECONO"mical  
autoMATION"

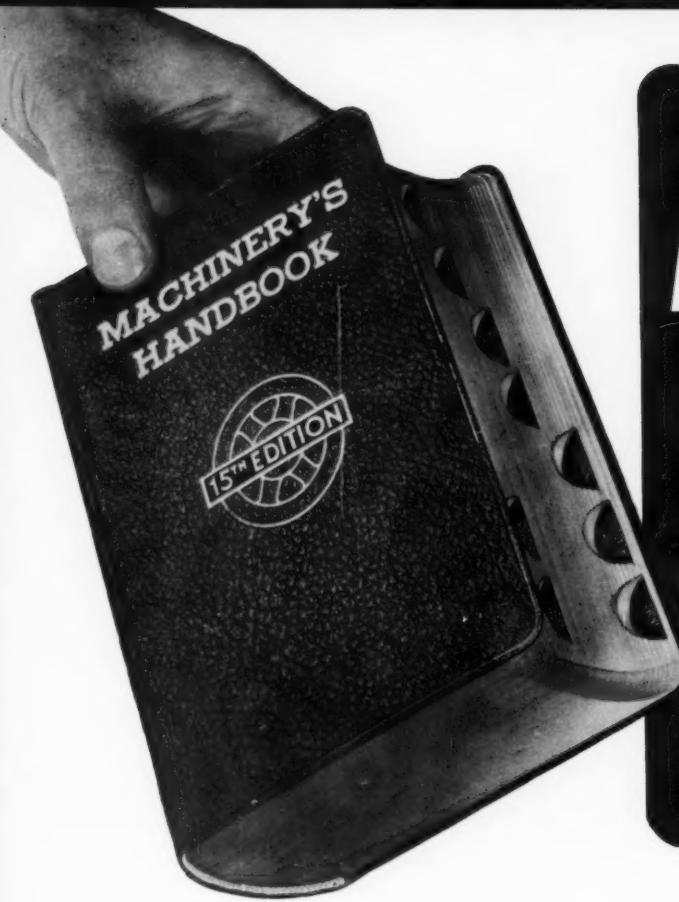


sets  
precedent  
with the be  
to process  
difficult pa  
like this...

H  
P  
MATIC

beef

parts



# The ACKNOWLEDGED AUTHORITY of the METALWORKING INDUSTRIES

For forty years . . . through fourteen editions . . . with over a million copies sold, MACHINERY'S HANDBOOK has been the indispensable reference book for designers and builders of mechanical products. Now the 15th Edition, with over 400 pages revised and brought up to date, gives you the latest and most authoritative information on present-day designing, manufacturing and metalworking practices.

#### Practical Information for Every Shop Man

A modern handbook is a necessity for every man who holds or hopes to hold a responsible job in the mechanical industries. Shop men, as well as engineers and designers, find MACHINERY'S HANDBOOK invaluable. It contains the kind of information that is needed wherever machines, tools, and mechanical devices are designed or constructed.

MACHINERY'S HANDBOOK contains 1911 pages of mathematical and mechanical tables, rules, formulas and general data (see complete table of contents on page 3). Its "math" and other tables never subject to change are accurate to the last decimal point, because Handbook users all over the world have been checking them for 40 years.

#### How Far Back Are You in the Handbook Parade?

Does your present Handbook give you *today's* answers? The 12th Edition of MACHINERY'S HANDBOOK was published in 1943—only 12 years ago—but . . . 474 pages were revised and 96 pages were added to provide new material for the 13th Edition in 1946. Then . . . 290 pages were revised to provide new material for the 14th Edition in 1949. And now . . . 432 pages have been revised to make the New 15th Edition better than ever and ready to help you tackle the problems of today.

MACHINERY'S HANDBOOK meets this need whether you are a designer, a machinist, a mechanical engineer, a student, a production executive, an apprentice, or an inspector.

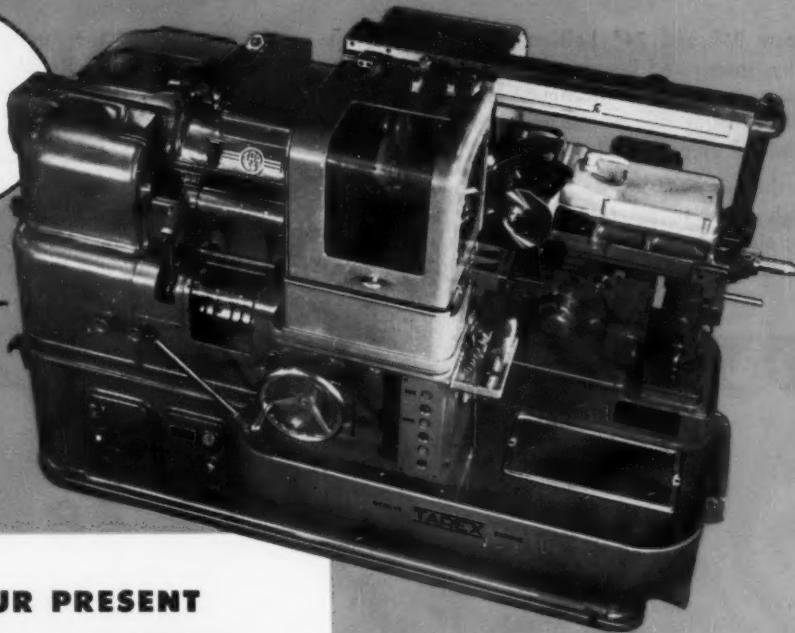
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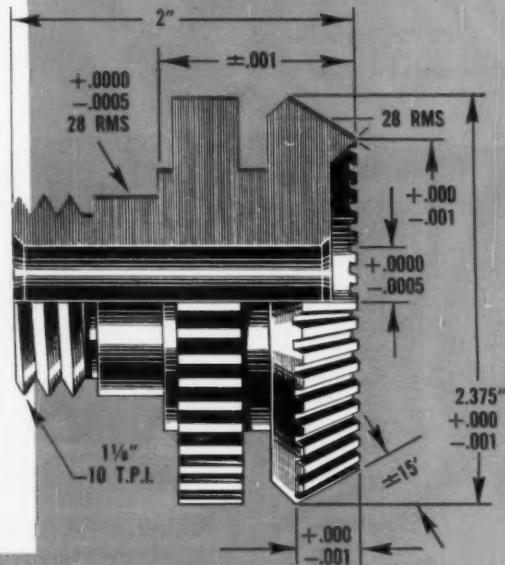
**THE INDUSTRIAL PRESS**  
**93 Worth Street, New York 13, N. Y.**





**CAN YOUR PRESENT  
AUTOMATIC EQUIPMENT  
make this  
BEVEL CLUSTER GEAR  
complete FROM BAR STOCK  
in one operation  
READY FOR GEAR CUTTING?  
...it can be done on the**

**TAREX**



# RUSSELL, HOLBROOK & HENDERSON, INC.

**292 Madison Avenue, New York 17, N. Y.**

# TWO MORE\* ALL

The new 21" and 24" LeBlond Regals give you capacity, speeds and horsepower you'd find in more expensive heavy type machines offered by other builders—and at one of the most attractive prices LeBlond has ever offered!

Here's the rundown. Standard 7½ HP, optional 10 HP for high speed ranges in both models (see chart); electric clutch and brake; feed reverse at the apron; heat-treated gears in head, quick-change box and

apron—plus all the famous big-lathe features that have made LeBlond Regals production favorites from coast to coast.

Headstock uses the same combination gear-belt drive construction that proved itself on the famous LeBlond Dual-Drive and is now incorporated on our new 16" heavy-duty lathe. Bed has hardened and ground replaceable steel ways like the ways on our larger machines. They are fitted according to the compensating

# TWO MORE\* ALL



New 21" and 24"

\*This makes five new lathes

introduced by LeBlond so far this year!

# NEW LEBLONDS

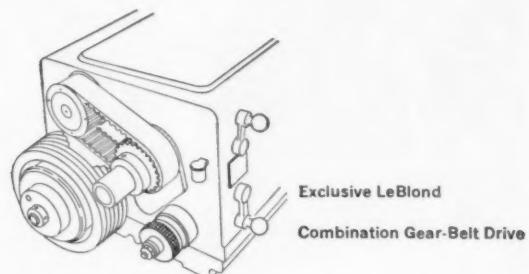
veeway principle to insure better distribution of forces for proven long-time accuracy and minimum wear.

Again, like higher-priced lathes, Regals are equipped with both feed rod and preloaded precision leadscrew for continued accuracy in thread chasing. Other big-lathe features—3 bearing spindle. Automatically-lubricated quick-change box. Wide carriage bridge with ample bearing surface. Rugged tailstock with plug clamping. In addition, you get general dimen-

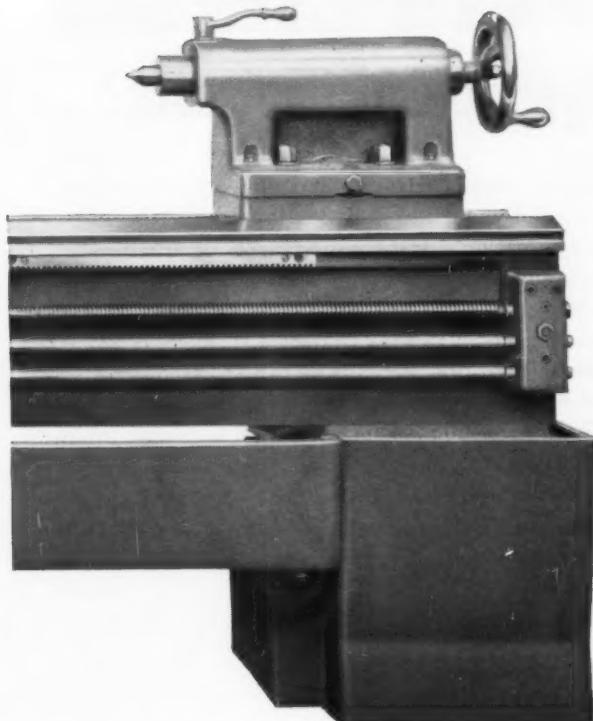
sions and construction details patterned after LeBlond heavy-duty engine lathes.

All of LeBlond's 70 years of experience has gone into the design and building of these new Regals. Only from the builder of a complete line of lathes can you get a low-priced lathe with all these big-lathe features. Get full details on the new 21" and 24" LeBlond Regal Lathes. See your LeBlond Distributor or write—Ask for Bulletin R-205D.

# NEW LEBLONDS



**Regal lathes deliver up to 10 H.P.!**



| STANDARD AND OPTIONAL SPEED RANGES<br>21" and 24" REGALS |   |
|--|---|
| 12 Standard Speeds:                                      |   |
| Gear Drive   | 18, 25, 35, 49, 70, 98, 136, 192 rpm.   |
| Belt Drive   | 260, 362, 510, 720 rpm.                 |
| 12 Optional Speeds:                                      |   |
| Gear Drive   | 27, 38, 53, 74, 105, 146, 204, 288 rpm. |
| Belt Drive   | 390, 544, 765, 1080 rpm.                |

*... cut with confidence*

**THE R. K. LEBLOND MACHINE TOOL COMPANY**  
Cincinnati 8, Ohio



*World's Largest Builder of A Complete Line of Lathes for  
More Than 70 Years*



## Is assembly one of your largest production costs?

It probably is. Wherever fastenings must be made, this simple truth applies: The cost of the fastener is but a tiny fraction of the cost of using that fastener in production. The key to reduced assembly costs is the fastener that helps high-paid assembly hands turn out better work—*faster*. The P-K® Self-tapping Screw is that fastener!

Using screws that don't come up to P-K standards can raise total assembly costs as much as 25%. Screw failures not only result in assembly slow-downs . . . but in parts spoilage and hidden weaknesses as well.

This is especially true in assembly by automation. Uniformity, such as P-K Self-tapping Screws offer, is automation's prime requirement for trouble-free assembly.

Why not talk to a Parker-Kalon Assembly Engineer —a man who is in daily contact with many different assembly set-ups. Perhaps he can show you how to reduce the number of fastenings in your product or how to solve a particularly difficult fastening problem. (That's his business.) Contact him through your local Parker-Kalon distributor.

**PARKER-KALON DIVISION, General American Transportation Corporation**  
Manufacturers of Self-tapping Screws, Socket Screws, Screwnails, Masonry Nails,  
Wing Nuts and Thumb Screws

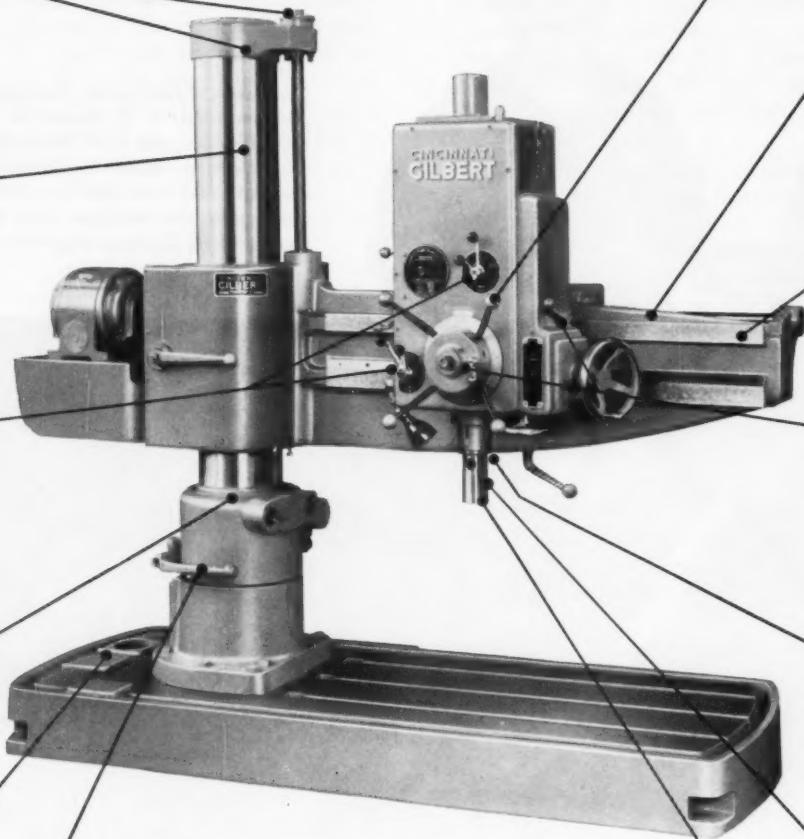
# PARKER-KALON® fasteners

Sold Everywhere Through Leading Industrial Distributors

Factory: Clifton, New Jersey—Warehouses: Chicago, Illinois—Los Angeles, California

# ONLY GILBERT RADIALS OFFER ALL THESE FEATURES

When you order a Cincinnati Gilbert radial, you get more new features per dollar than any other radial can offer. And every feature is designed to give you maximum return on your investment—in performance, productivity, and dependability.



Safety elevating nut protects both operator and machine

Weight carried on opposed Timken bearings

Hardened column available

Direct-reading speed and feed shifters; gears counterbalanced for easy shifting

Adjustable ball bearing rollers on hardened ring for maintained rigidity

Long heel on heavy base provides 360° stability

Powerful, accurate electric column clamp available

Four-lever turnstile cuts machine handling time

Balanced arm resists torsion, compression, tension forces

Head rides on anti-friction bearings; clamps three surfaces

When disengaging positive feed clutch, spindle won't drop

Full spindle support near tool; runout is less than .001"

Hardened tang slot is an exclusive Gilbert feature

You can always see the spindle; get extra use of spindle travel

And don't overlook these additional features:  

- wide range of spindle speeds for efficient tool performance;
- hardened gears throughout the machine;
- standard or special tap leads available;
- modern styling which reduces housekeeping, convinces customers that your shop is up-to-date;
- low-cost financing: 8% simple interest (4 1/4 % add on), up to 5 years to pay.

 Write or call for Bulletin 349.

*those who buy Gilbert buy Gilbert again*

THE CINCINNATI GILBERT MACHINE TOOL CO.  
3346 BEEKMAN STREET, CINCINNATI 23, OHIO

*They cut out three oils by changing to one...*



Standard Oil lubrication specialist Bob Cleland and plant manager I. G. Smallegan inspect work furnished by operator Dick Stockwell. Giving technical help to customers like this is something for which Bob Cleland is well fitted. Bob has a mechanical engineering degree from Michigan State and has completed the Standard Oil Sales Engineering School.



# STANICUT Oil 166 BC

*Screw machine plant saves on oil inventory and handling, receives other benefits by converting to dual-purpose cutting oil.*

Grand Rapids Metal Products Company's problem was the mixing of cutting and lubricating oils in their National Acme and Gridley screw machines. In all, four oils were used. In some machines a cutting oil, two lubricating oils and a base oil were employed to improve machining characteristics. Lubricating oil leaking past seals mixed with the cutting oil, reducing cutting oil qualities. Oil mixtures were constantly varying, and troubles in tapping resulted.



Standard Oil's Bob Cleland, working with plant management, suggested STANICUT Oil 166 BC. This oil, he explained, is a dual-purpose oil. It can be used for lubrication as well as for cutting, and no dilution of the cutting oil can occur.

**After a week's trial** in one machine, the entire plant was converted to STANICUT Oil 166 BC. Tap troubles were reduced, resulting in much less down time. Spindle speeds have been increased, yet the spindles run cool. Oil inventories have been reduced from four to one.

STANICUT Oil 166 BC does not corrode bearings, gears, bushings, spindles or other machine parts. While STANICUT Oil 166 BC contains E.P. additives, it does not stain copper or brass.

**Get the facts** on how STANICUT Oil 166 BC can help you. Call the Standard Oil office nearest you anywhere in 15 Midwest and Rocky Mountain states. Or write to Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

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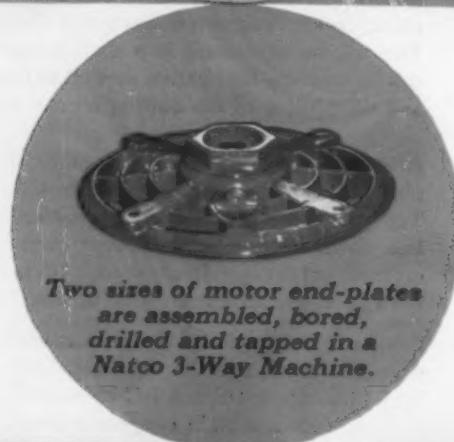
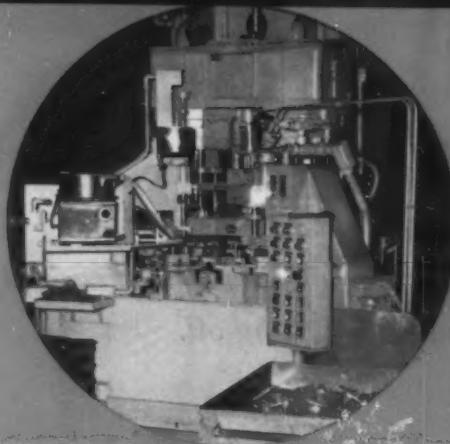
## Quick facts about STANICUT OIL 166 BC

---

|   |   |
|---|---|
| 1 | A dual-purpose oil — suitable for both cutting and lubrication. |
| 2 | Non-corrosive to work or machines.                              |
| 3 | Formulated with E.P. additives.                                 |
| 4 | Stable under all normal conditions.                             |
| 5 | Non-irritating.   |
| 6 | A cutting oil that permits high operating speeds.               |
| 7 | Non-staining to either copper or brass.                         |



**STANDARD OIL COMPANY**  
(Indiana)



*Two sizes of motor end-plates  
are assembled, bored,  
drilled and tapped in a  
Natco 3-Way Machine.*

*At Wagner Electric Corporation*

## **One Natco**





# Assembles, Bores, Drills and Taps... Reduces Labor Cost 70% On Small Motor End-Plates

This Natco combination assembly and multi-drilling machine presses a bearing sleeve into the end-plate, rough and finish bores the outside bearing-cap hole, drills an oiler hole at an angle, drills four (4) thru-bolt holes, and drills and taps two (2) 8x32 cover plate holes. *Production is 170 pieces per hour.*

This Natco accommodates two sizes of motor end-plates without changes in the basic rotary-table tooling. In addition to this important versatility the engineers at Wagner Electric point out these other advantages:

- one operator controls the assembly and machining from one station.
- work scheduling is simplified due to the short machine cycle.
- in-process inventory can be kept at a minimum because of high production rate.
- floor space is made available for other operations.

Natcos perform all kinds of drilling, boring, facing and tapping jobs in every conceivable combination and sequence.

Ask the Natco Field Engineer about the newly perfected tape control systems for Natco production tools.

## National Automatic Tool Company, Inc.

*Richmond, Indiana Multi-spindle drilling, boring and tapping machines. Special machines for automatic production. Call Natco Offices in Chicago, Detroit, New York, Buffalo, Philadelphia, Cleveland, Los Angeles; distributors in other cities.*

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American Bosch Arma Corp.  
American Machine & Foundry Co.  
American Type Founders, Inc.  
Axelson Manufacturing Co.  
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Cameron Machine Company  
Caterpillar Tractor Company  
Continental Gin Company  
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Crankshaft Machine Company  
A. B. Dick Company  
Ekstrom, Carlson & Co.  
Felco Gear Shaper Co.  
Food Machinery & Chemical Corp.  
Foote Bros. Gear & Machine Corp.  
Gillette Safety Razor Co.  
Harris-Saybold Co.  
Hartford Special Machinery Co.  
Frank G. Hough Co.  
Jeffrey Manufacturing Co.  
Joy Manufacturing Co.

A. O. HOLMBERG, Vice President—Manufacturing

THE GOSS PRINTING PRESS COMPANY

Division of Miehle-Goss-Dexter, Incorporated

# a man who came



"I first heard of the JIGMIL Technique for boring accurate holes in precise locations at an engineering lecture-meeting in Philadelphia. What I heard made me curious because the story seemed exaggerated."

Kempsmith Machine Company  
Kidder Press Co., Inc.  
McNally-Pittsburg Mfg. Corp.  
Miehle Printing Press & Mfg. Co.  
Morris Machine Tool Co.  
Osborn Manufacturing Co.  
Oster Manufacturing Co.  
Package Machinery Co.  
Paper Converting Mfg. Co.  
Parrish Mach. Co., Inc.  
Rockford Machine Tool Co.  
**S & S** Corrugated Paper Machy. Co.  
Stacy Machine Works, Inc.  
Sunnex Products Company  
George W. Swift, Jr., Inc.  
Torrington Co.  
Vandercook & Sons Inc.



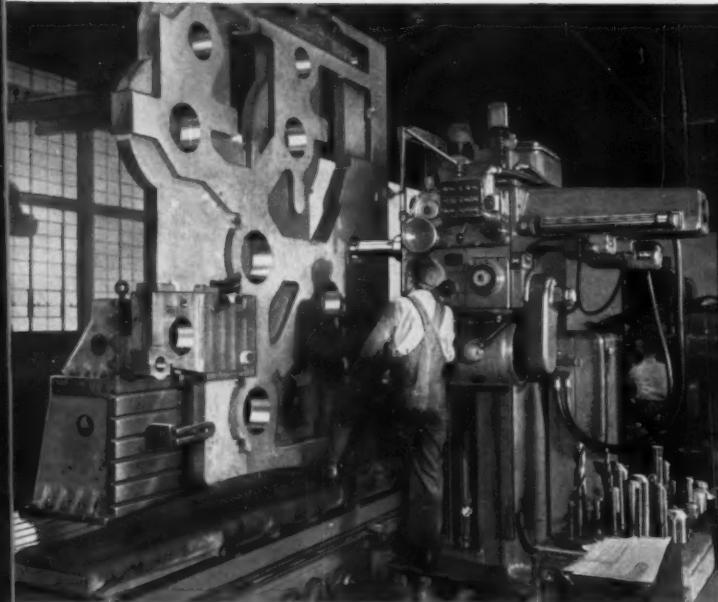
"I accepted an invitation to go to Fair Street and there saw the JIGMIL Technique in operation doing jigless boring to degrees of economy and precision that verified what I had heard in the lecture. The gains that were apparent from the analysis made for us by the DeVlieg engineers caused us to purchase a number of JIGMILS. These machines have been in use for several years. We have experienced many advantages. The principal ones are improved quality and a considerable reduction in machining, inspection and assembly times. The quality of the work resulting from the outstanding JIGMIL accuracy has had a far-reaching improving effect on the general quality and performance of our product."

A. O. HOLMBERG

WILL YOU BE THE NEXT TO VISIT FAIR STREET

DE VLIEG MACHINE COMPANY

# to Fair Street



## A TYPICAL EXAMPLE OF JIGMIL ACCURACY

Goss uses the JIGMIL Technique for boring components of their famous high-speed newspaper, magazine and color printing presses. Illustrated above is one of the side frames for an 80 ft. multi-color press recently built by Goss. This part was bored on a Model 4B-120 SPIRAMATIC JIGMIL. JIGMILS were used for boring approximately 2260 holes in the side frames and gear boxes for this press. In the assembled press, the accuracy of hole size and spacing made it possible to hold the register of 5 colors within .001".

Our newest catalog  
will help you decide.  
May we send it?



450 FAIR STREET, FERNDALE, DETROIT 20

**DeVlieg**  
**SPIRAMATIC**  
**JIGMILS®**  
ACCURATE HOLES IN PRECISE LOCATIONS

**want to check  
your  
cutter grinding  
costs?**



The Ingersoll Cutter Grinder is Standard Equipment for Low Cost Sharpening of Inserted Blade Cutters.

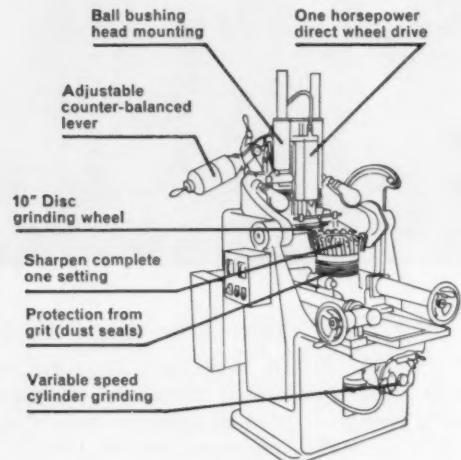
Let us resharpen one of your typical inserted blade cutters. This free demonstration, on a new Ingersoll Cutter Grinder, will tell you what you can expect to save, by replacing standard tool grinders or Ingersoll grinders of obsolete design with new Ingersoll machines.

Accurately ground cutters assure time and dollar savings, longer tool life, better tool and machine performance.

Write for shipping instructions—for a Grinding Cost Check-up.

**Ingersoll Cutter Grinder—for a money saving investment of about \$5,000\*  
(with normal accessories)**

4" to 30" Diameter Cutters. Accuracy is assured. Grinds both periphery and face in one setting. Simple and easy to operate. Faster than Universal Grinders. Grinds a constant clearance.



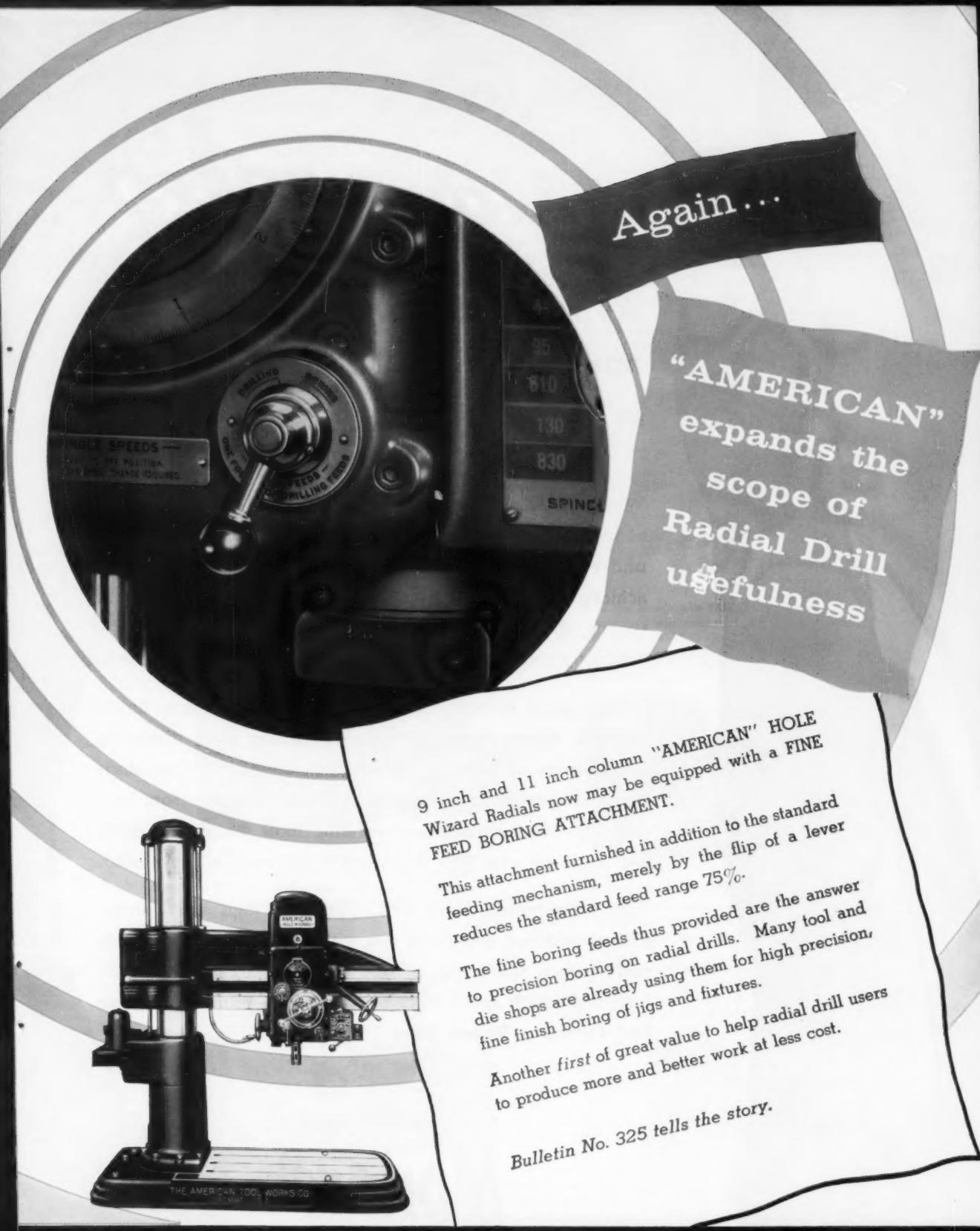
This 48-page book includes valuable grinding practice "do's and don'ts". Send for your copy today.

## CUTTER DIVISION

**THE INGERSOLL MILLING MACHINE COMPANY**

ROCKFORD

ILLINOIS



Again...

"AMERICAN"  
expands the  
scope of  
Radial Drill  
usefulness

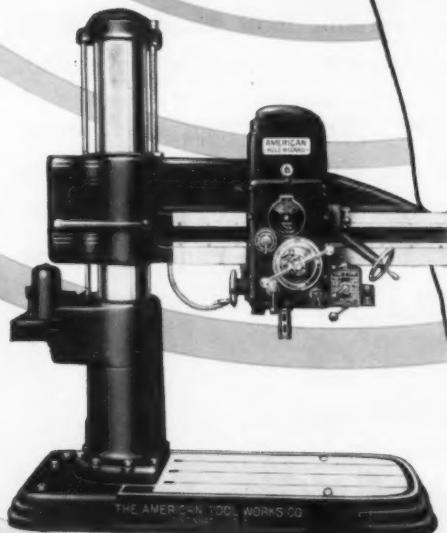
9 inch and 11 inch column "AMERICAN" HOLE  
Wizard Radials now may be equipped with a FINE  
FEED BORING ATTACHMENT.

This attachment furnished in addition to the standard  
feeding mechanism, merely by the flip of a lever  
reduces the standard feed range 75%.

The fine boring feeds thus provided are the answer  
to precision boring on radial drills. Many tool and  
die shops are already using them for high precision,  
fine finish boring of jigs and fixtures.

Another first of great value to help radial drill users  
to produce more and better work at less cost.

Bulletin No. 325 tells the story.



**THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.**

**LATHES AND RADIAL DRILLS**



# *More SPEED . . .*

**All these modern Monarchs  
have what it takes—  
in speed, range and power.**

Why pay for 100% of a lathe — then use only 60 to 75% of its productivity? That's what happens when you operate under less than optimum turning conditions. These are achieved, principally, by utilizing correct feeds, speeds, and tooling. And machinability tests keep proving the value, under many conditions, of working at higher and higher speeds.

High-speed turning can lower cycle time, improve finish, afford a higher degree of accuracy, reduce work distortion and economical tool life can still be obtained. It's an absolute prerequisite for realizing the fullest advantage from high crater-resistant carbide and ceramic tools. So if you don't use it on all jobs, you still want it available when needed.

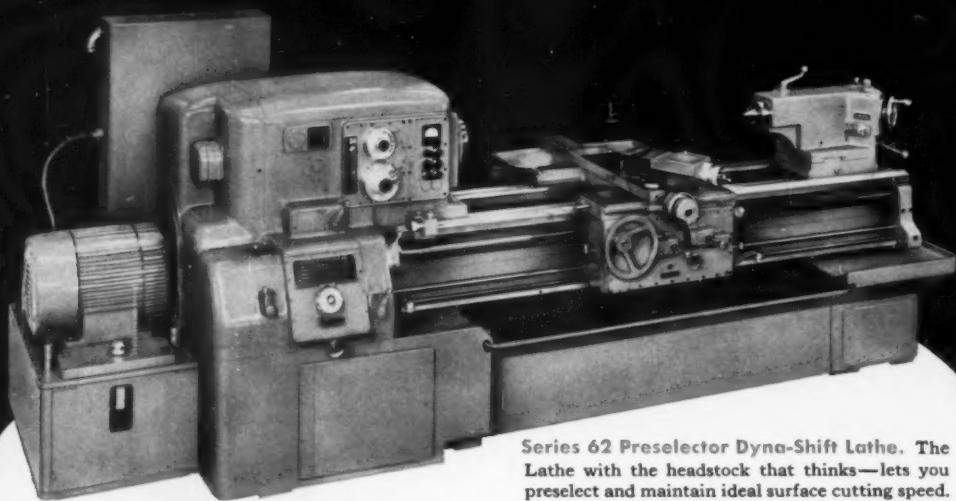
In other words, don't buy a lathe for high speed alone. But, considering how often you will need this feature for top performance, don't buy a lathe without it. These Monarch Lathes are high speed machines . . . . The **Monarch Machine Tool Company, Sidney, Ohio.**

**Monarch**  
TURNING MACHINES

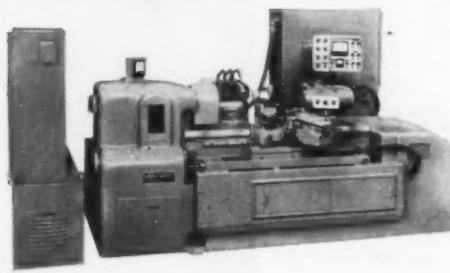


FOR A BETTER TURN FASTER  
... TURN TO MONARCH

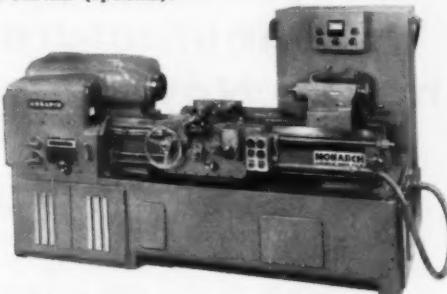
# ... for full productivity



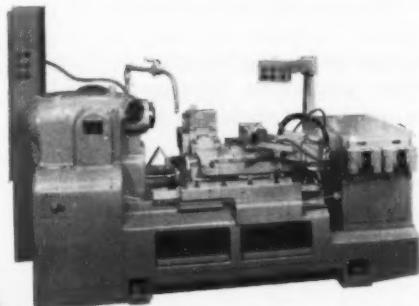
**Series 62 Preselector Dyna-Shift Lathe.** The Lathe with the headstock that thinks—lets you preselect and maintain ideal surface cutting speed. 36 speeds from 14-1750 R.P.M. (standard); 25-2500 R.P.M. (optional).



**The Mona-Matic.** A fast, flexible Air-Gage Tracer controlled, automatic cycle lathe for maximum productivity. Three models; one with constant surface cutting speed. Any one of three ranges between 87-3000 R.P.M. or 160-2760 R.P.M.



**Series EE, Model 1000**—The ultimate in accuracy, speed and time-saving convenience, whether used for production or toolroom. Four infinitely variable speed ranges; speed 25-2000 R.P.M.



**The Hydra-Slide**—An exceptionally versatile high-production chucking lathe. Fully automatic cycle controls almost any desired combination of 4 hydraulic slide movements. Any one of three ranges from 155-2700 R.P.M.



**10" Model EE**—Sensitive Precision Toolmaker's Lathe and Precision Manufacturing Lathe Models. Infinitely variable speeds from 5-3000 R.P.M. (standard) or from 6.5-4000 R.P.M. (optional).

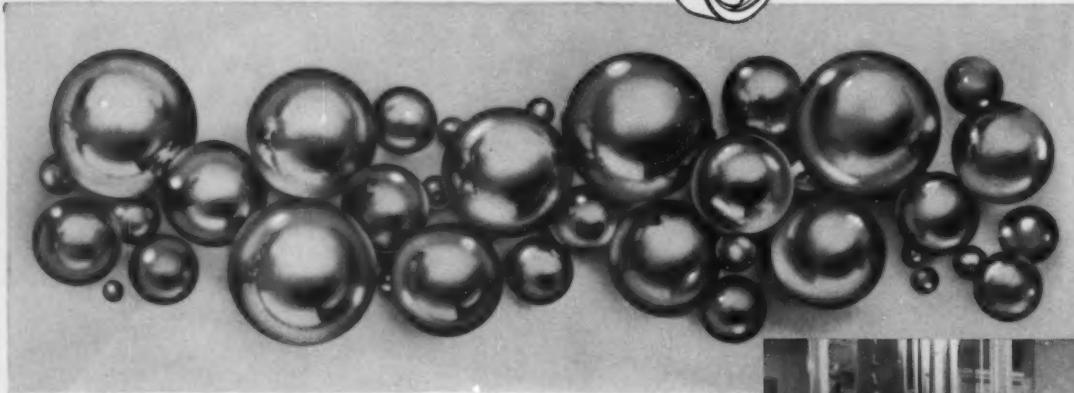
# FACTS

about

## NEW DEPARTURE



STEEL BALLS



### Why Leading Manufacturers Choose New Departure Steel Balls

Prompt delivery . . . quality . . . and quantity . . . to fit your specifications! These are the major reasons why leading manufacturers choose New Departure to fill their steel ball needs.

To assure that every steel ball ordered meets your most rigid specifications, New Departure performs its own metallurgical laboratory inspections, its own annealing and wire drawing operations.

And . . . to process all orders readily, New Departure ball manufacturing facilities are maintained completely independent of all other production. This means that high-carbon chrome and stainless steel balls are quickly available in a complete range of sizes and specifications in quantities.

In addition, New Departure produces balls of special materials such as high nickel-cobalt base alloys, tool steel, plastics, nylons and vacuum-melted materials. For immediate attention to your ball needs, write or call New Departure, Division of General Motors, Bristol, Connecticut.



Talyrond gaging graphs of ball sphericity and surface finish give readings to within three one-millionths of an inch, assuring product superiority that meets your most rigid specifications.

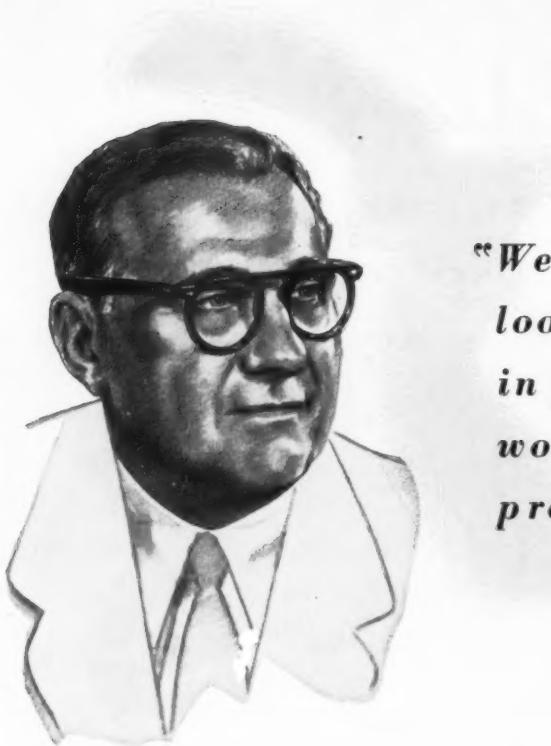
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**BALL BEARINGS MAKE GOOD PRODUCTS BETTER**

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

-84—MACHINERY, September, 1957

For more information fill in page number on Inquiry Card, on page 255



***"We are constantly on the look-out to make investments in plant and machinery that would pay for itself in our proper cycle"***

**George Spatta, president  
CLARK EQUIPMENT COMPANY**

CLARK EQUIPMENT COMPANY manufactures industrial trucks, construction machinery and power train components for trucks, buses, and earthmoving machinery. We operate six plants in Michigan and one in Canada.

In the decade since World War II we have put \$33 million in properties, of which about \$22 million was for manufacturing machinery and equipment. A substantial part of the new equipment and plants was to manufacture new products introduced during this ten-year period.

While some companies have elaborate systems of measuring the advisability of replacing equipment, this company has, for better or worse, done this job more or less on a master mechanic-superintendent-plant manager "feel basis." We have reason to believe that this policy has worked pretty well for us. We are highly integrated,

which is to say we manufacture, as far as possible, all of our own components, and our direct labor is but a few cents in a dollar's worth of product, from which it would appear that our production lines are pretty efficient.

We are, of course, always on the look-out into so-called "automation" (this is a great misnomer—we have been automating for 100 years in this country) and we also employ much technical effort in re-designing parts for low-cost manufacture. All in all, we believe that we are up-to-date in our manufacturing processes and that the equipment we employ is suitable for the work we do. Our direct labor in a dollar's worth of product is very low. We have a cash flow of several million dollars a year from depreciation and we are constantly on the look-out to reinvest this money in plant and machinery that will pay for itself in our proper time cycle.

**Rockford  
Insert  
Group**

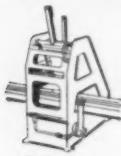
*keep gathering metal working  
production ideas... be well informed  
when you replace machinery . . .*

YOU GET A

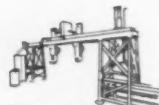
# Two-Fold

## CREATIVE AUTOMATION SERVICE

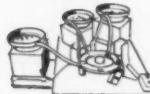
AT  
**W. F. & JOHN BARNES**



Probe-Type  
Inspection Machine



Transverse-Type  
Loader



Metal Fastener  
Assembly Equipment

Now to better serve your needs and help you solve automation problems quickly, Barnes offers a two-fold coordinated service.

### COMPLETE PRODUCTION-LINE ENGINEERING

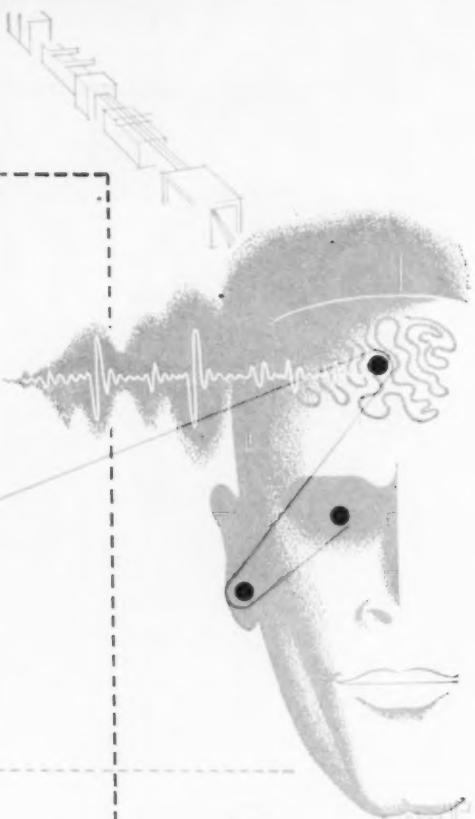
1 For new production line methods calling for either automatic or semi-automatic operations, you'll find at Barnes an experienced engineering staff to work with you. Detailed plans and proposals will be submitted for your consideration and can be depended upon to give you the latest in automation ideas and the very best of proven mechanical, hydraulic, and electrical actuation methods. Ask for a survey early in your planning program.

### DESIGNING & BUILDING SPECIALIZED UNITS

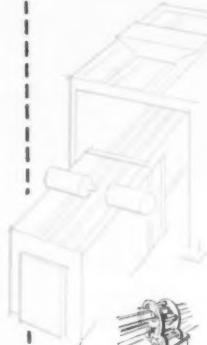
2 The second and equally important part of Barnes two-fold service is the designing and building of specialized individual units to suit your specific needs. At Barnes you'll find a coordinated service where electrical, mechanical, hydraulic, fixture and tool engineers work together as a team. The combined efforts of a highly skilled and experienced engineering staff, coordinated with complete manufacturing facilities, help you save time by eliminating divided responsibility.

### ASK FOR A METHODS ANALYSIS

Find out today why more and more Production Executives are turning to Barnes for a practical solution to their automation problems. We will be pleased to analyze your requirements, offer recommendations, and submit a cost estimate in a formal proposal if you so desire.



Casting Automatic  
Leak Test Machine



Automatic  
Roll-Over Unit

Builders of Better  
Machines and  
Equipment since  
1872



### AUTOMATION SECTION

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SPECIAL MULTIPLE SPINDLE MACHINE TOOLS • SPECIAL  
PROCESS EQUIPMENT • SPECIAL ELECTRICAL CONTROLS



MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

Machinery, September, 1957

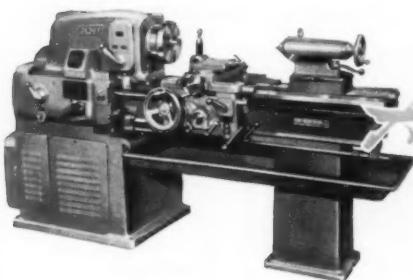
*You get  
top value per dollar  
with a Hendey No. 2E Lathe*

**timesaving controls step up efficiency  
of toolroom or production turning!**



Because all controls were designed with the operator in mind, the Hendey No. 2-E general-purpose lathe today is setting new standards of efficiency on both toolroom and production jobs. Two outstanding features are the electronic drive that permits infinitely variable speed control, and the instantaneous dynamic brake for rapid stopping and reversing of the spindle.

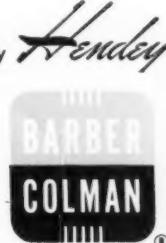
Here are more Hendey "top-value" features you'll want to check further: quick-change gearbox providing 48 changes of threads without changing gears; thread-chasing dial for returning carriage to the same thread groove; quick-change gearbox for 48 changes of feed without gear change; pushbutton energizing of main motor; and two control levers, permitting operator to start, stop, or reverse the spindle from any working position. Contact your nearby Hendey dealer for complete details and specifications.



*for precision with production, buy*

*Hendey* machine division  
BARBER-COLMAN COMPANY

92 Loomis St., Rockford, Illinois



## "Engineered Production" Service

FOR BROACHING



### American's "Engineered Production" Service

... gives the broach-user the complete three-part service that is essential to obtain the most practical broaching method. Years of design and production engineering experience, unavailable at any price, are effectively added to your staff at no extra cost.

**THE JOB**—Broaching I.D. of wrist pin hole in connecting rods.

**THE RESULT**—Four pull broaches on an American Vertical Hydraulic broaching machine finish the holes at a production rate of 600 parts per hour.

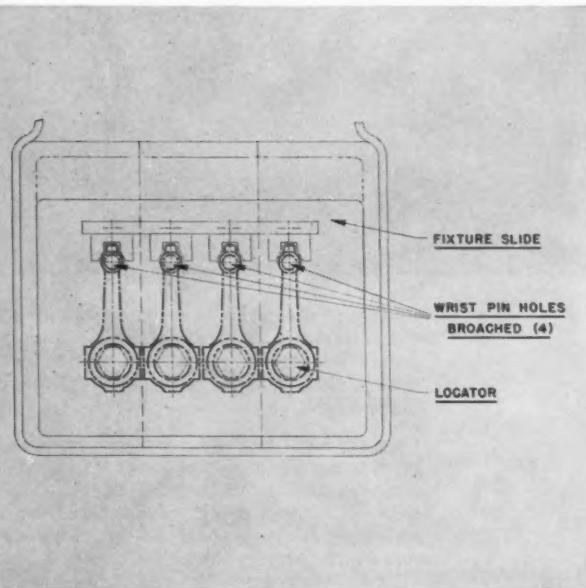


# It takes all 3

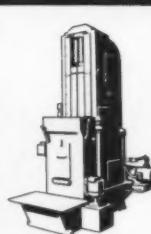
1

### PROPER BROACH TOOL DESIGN

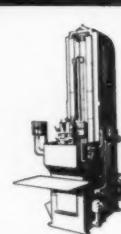
Top-quality results on any broaching operation require starting the job with design of the broaching tool itself. In solving this all-important first step, American Broach considers stock removal, length and width of cut, finish tolerances required, etc. High-quality work and long tool life result because broach and machine are designed to operate as a team. Broaches are pulled through four at a time to finish the wrist pin holes at the required rate.



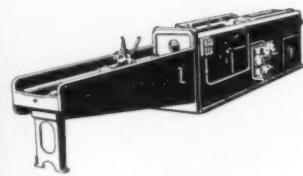
Broaching Tools



Three Way



Single Ram



Horizontal



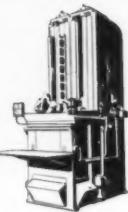
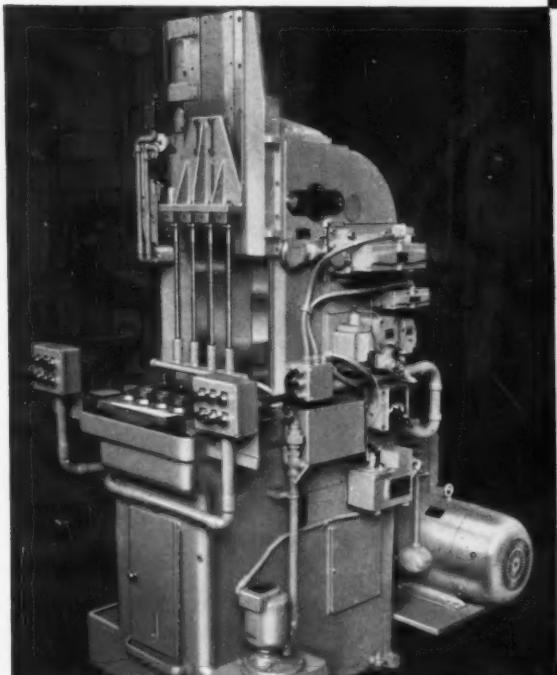
MACHINES DESIGNED TO MEET YOUR NEEDS **ROCKFORD, ILLINOIS, U.S.A.**

# to give you peak broaching performance

2

## SPECIFYING THE RIGHT MACHINE

Production rate required, length and speed of stroke, relationship to other production machinery, available floor space, etc. determine the selection of the broaching machine capable of doing the best job. At American, machine selection follows design of the broaching tool. The four-station work transfer slide, electrically interlocked with the machine cycle, is provided with locating units and bushings for supporting work piece during the broaching stroke.



Duplex Ram



Presses

3

## EFFICIENT FIXTURING

Whatever your parts geometry or hourly needs, fixturing by American Broach forms a vital third link in the production chain. In this setup, the operator loads four parts in fixture and pushes control button. The slide moves in for the broaching stroke and returns for unloading. Broaches are returned to start position during unloading. Thus, even with relatively inexperienced operators, production schedules are maintained since the "skills" are built into the tool, machine, and fixtures.



Get more facts in American  
Bulletin A618. Write  
for your free copy today.



American

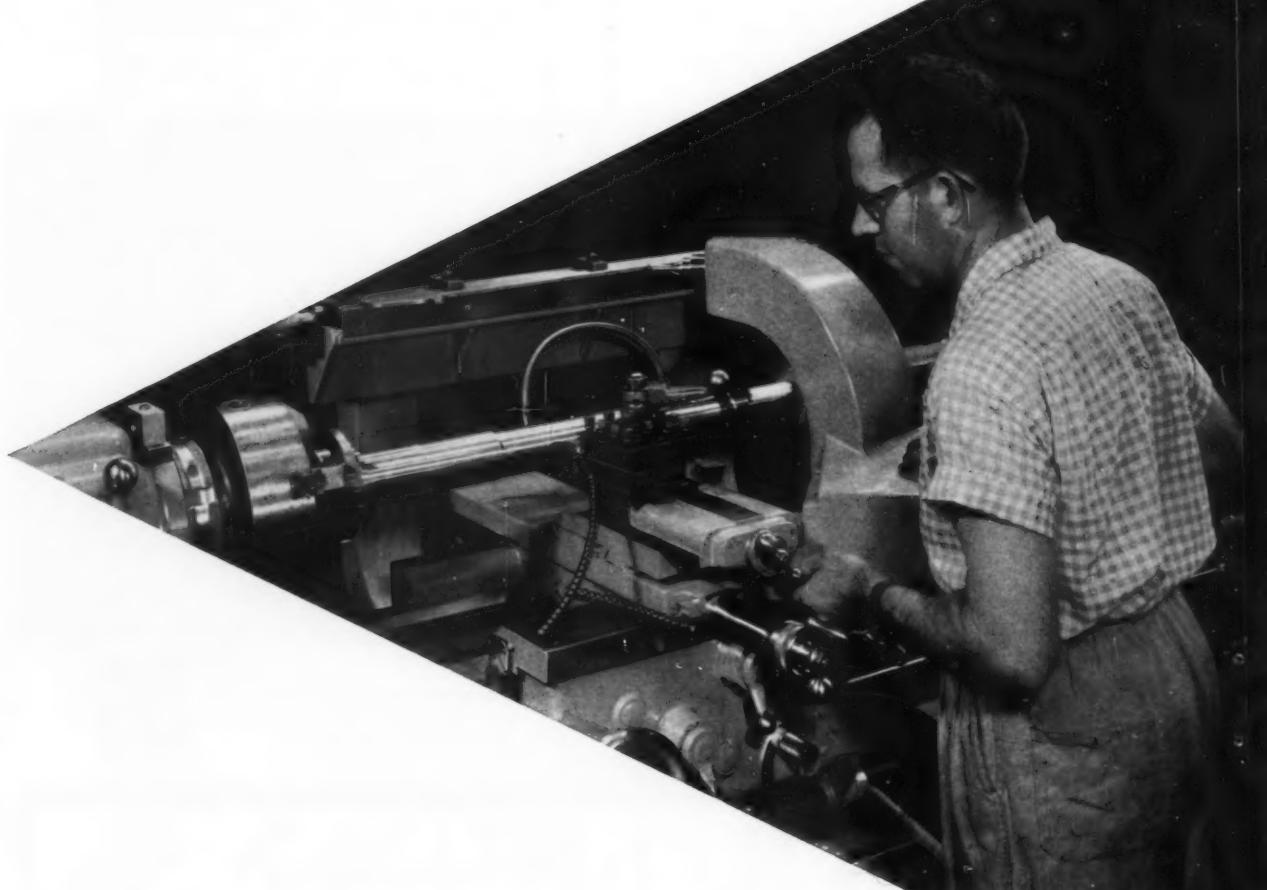
**SUNDSTRAND BROACH & MACHINE DIVISION**  
SUNDSTRAND MACHINE TOOL COMPANY  
ROCKFORD, ILLINOIS



**the New Rockford Tracer Lathe . . .**

**with hydraulic**

**KOPY**



Machinery, September, 1957

CENTER OF MACHINE-TOOL EXCELLENCE

**ROCKFORD, ILLINOIS, U.S.A.**

## - KAT → DUPLICATOR

### check these PLUS FEATURES

Duplicating attachment designed and built by the lathe manufacturer specifically for Rockford Lathes. No divided responsibility.

Kopy-Kat Valve features proven accuracy, precision manufacture, built-in retract.

Power unit requires no additional floor space - includes sealed unit, compensating pump and filter.

Electrical controls are combined and interlocked with machine controls from centrally located push button station.

European tool post.

All hydraulic lines are clear of chips and coolant - out of the operator's way.

Automatic feed cut-out - a standard feature on Rockford Tracer lathes.

. . . is the greatest value ever offered in a tracer lathe. Forty years of building fine lathes and 25 years of hydraulic duplicating experience make an unequalled combination. Extreme accuracy of duplication, coupled with enough ruggedness to utilize the full horsepower of the machine, make Rockford Tracer Lathes the preference for repetitive turning in any volume.

The Rockford Tracer Lathe can be converted to a completely standard engine lathe in a matter of minutes, thus adding to its versatility and flexibility for small lot production.

Complete interchangeability of multiple diameter work can be achieved by unskilled operators at production speeds comparable to turret lathes. These machines are rugged enough for heavy production work, yet flexible enough for tool room or job shop production.

Ask for bulletin No. 1002, or send us prints of your applications for free production estimate.

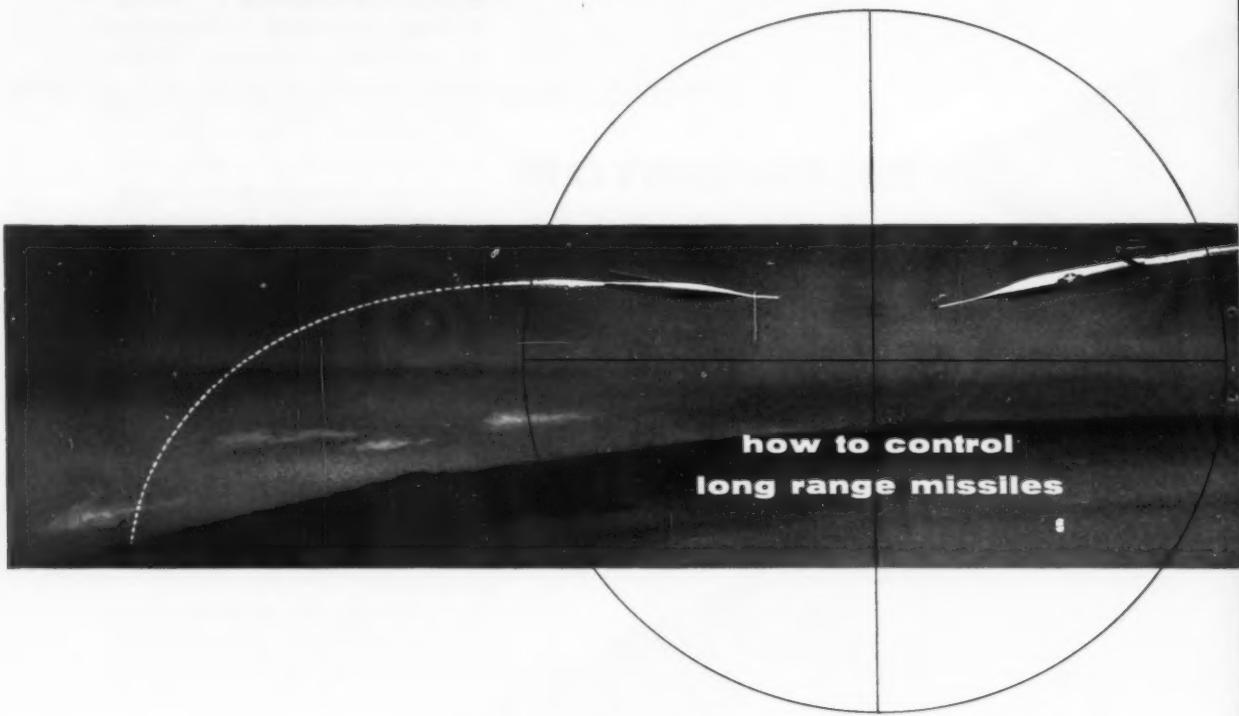


MEDIUM-SIZED  
ECONOMY-PRICED

ROCKFORD MACHINE TOOL CO.  
2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS



# *a new concept in gear accuracy!*



The control systems of modern missiles and aircraft are the "brains" which guide them to the target. Higher speeds, longer ranges and increased altitudes necessitate much more accurate control systems than in the past. One key to greater accuracy is gears made to previously unobtainable tolerances — gears which have an effective angular error of transmission of no more than ten seconds. And since speeds and ranges are increasing almost daily, the trend is toward closer and closer tolerances.

Barber-Colman engineers, working closely with Sperry Gyroscope engineers, have developed a machine and hobs which cut gears to closer tolerances than ever before produced. This machine is known as the "Ultracision" hobbing machine, and it cuts gears which will transmit uniform motion within ten seconds of arc or less, on a gear of 4" diameter. This machine is now hobbing gears *on a production basis* in the Sperry plant.

What does an error of ten seconds mean? It means that a plane flying 5000 miles would be within 400 yards of target at destination if dependent on gear accuracy alone in the navigation system. Five years ago, a one-mile error was good enough, but it is not

today. More accurate gears are a primary requirement for these precision controls.

We have been asked to compare ten seconds of angular error to a given amount of total composite error. Such a comparison is not practical because they involve two entirely different methods of inspection. Theoretically, one function of a gear is to transmit uniform angular rotation within the required limits of accuracy. Therefore, the measurement of angular error provides a direct method for determining the rotational accuracy of the gear. Total composite error is the amount of center distance variation obtained by rolling a gear with a master gear or rack. This method provides a relative measure of gear accuracy.

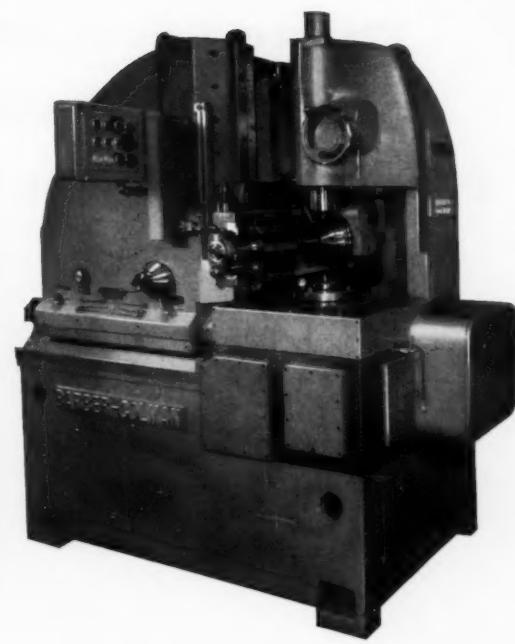
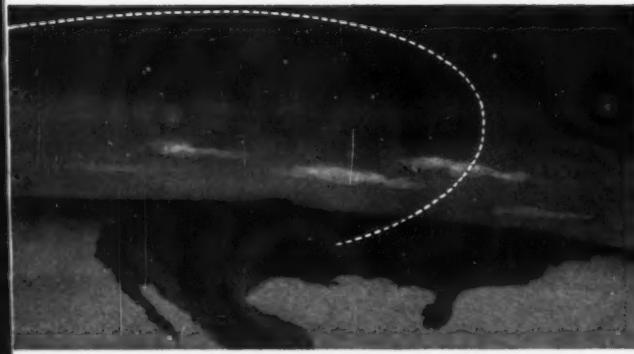
In trying to obtain the very finest gears, Sperry engineers have developed a method of inspecting angular errors with fantastic accuracy. They can now measure angular error between any corresponding points on gear teeth profiles to an accuracy of one-half second of arc. This method measures the effect of spacing, lead and profile errors. Presently allowable errors cannot exceed ten seconds of true angular displacement at any diameter along the involute.



Machinery, September, 1957

CENTER OF MACHINE-TOOL EXCELLENCE

**ROCKFORD, ILLINOIS, U.S.A.**



One of the most important features of the "Ultracision" hobbing machine is the accuracy of the relative rotation between the work spindle and the hob spindle. This is probably the most important single feature affecting accuracy of gears produced. This relative rotation was inspected dynamically by means of a theodolite and a camera. All other machine elements were made to extremely small tolerances, resulting in hobbed gears within the required tolerance of ten seconds.

Original hobs for this machine were made to one-half the tolerances of Class AA hobs. However, tests showed that hobs made to Barber-Colman Class AA tolerances were accurate enough for this application, and they are now being used on this machine. Although Class AA tolerances are used, the hobs are really more accurate than these tolerances would

indicate because the diameter is over twice the diameter of a standard hob of an equivalent pitch.

Since Barber-Colman engineers have designed and built the hobbing machine which cuts the world's most accurate gears, they have the experience to recommend the machine to produce gears to your accuracy requirements. In most cases, standard-type machines will satisfy your requirements. On our most accurate standard-type machine, we guarantee that it will hob a 4" PD, spur gear within .0002" adjacent and .0004" non-adjacent spacing error.

We invite you to submit your gear specifications and problems for analysis and recommendation by our engineers.

For more information about the "Ultracision" hobbing machine, write for descriptive literature.

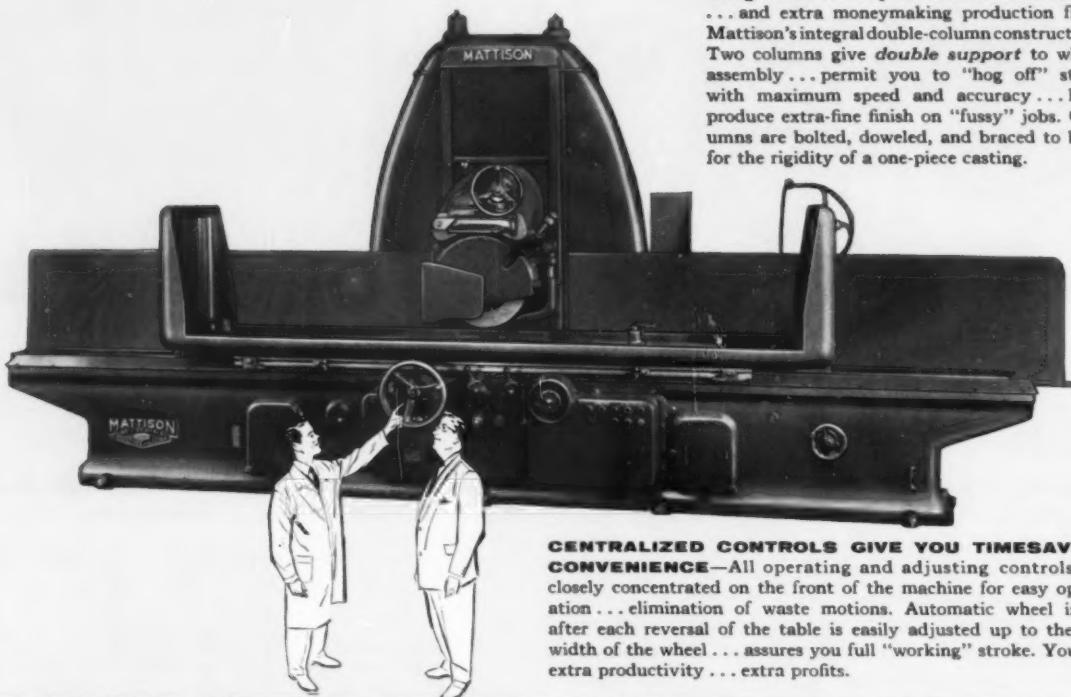
## **BARBER-COLMAN COMPANY**

629 ROCK STREET • ROCKFORD, ILLINOIS

*Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines*



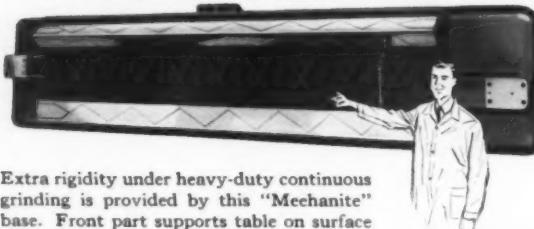
# These "Power-Designed" features make this Mattison Surface Grinder your kind of machine tool-in every way!



You get extra stability . . . extra wheel efficiency . . . and extra moneymaking production from Mattison's integral double-column construction. Two columns give *double support* to wheel assembly . . . permit you to "hog off" stock with maximum speed and accuracy . . . help produce extra-fine finish on "fussy" jobs. Columns are bolted, doweled, and braced to base for the rigidity of a one-piece casting.

**CENTRALIZED CONTROLS GIVE YOU TIMESAVING CONVENIENCE**—All operating and adjusting controls are closely concentrated on the front of the machine for easy operation . . . elimination of waste motions. Automatic wheel index after each reversal of the table is easily adjusted up to the full width of the wheel . . . assures you full "working" stroke. You get extra productivity . . . extra profits.

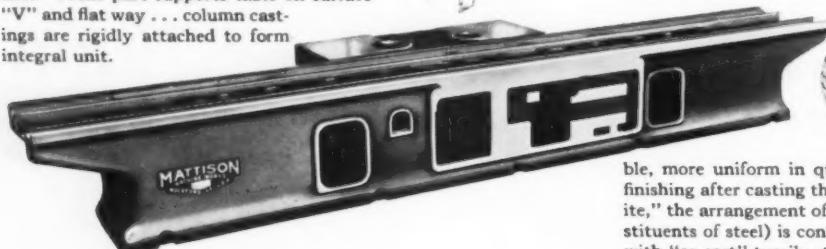
## Heavily cross-ribbed table . . . massive base . . . give you extra rigidity!



Extra rigidity under heavy-duty continuous grinding is provided by this "Meehanite" base. Front part supports table on surface "V" and flat way . . . column castings are rigidly attached to form integral unit.

This strongly reinforced, cross-ribbed table assures rigid support without distortion . . . even when handling long, heavy castings in large production runs. Use of "V" and flat way gives larger bearing surface . . . precise alignment of work under the wheel. Table never overhangs the bed.

## "MEEHANITE" CASTINGS, WITH ACCURACY THAT WON'T WEAR OFF



Extra stability and long-lasting accuracy are actually cast into Mattison Grinders by use of "Meehanite" for all castings. "Meehanite" is more durable, more uniform in quality, more adaptable to precision finishing after casting than ordinary cast iron. In "Meehanite," the arrangement of pearlite and graphite (primary constituents of steel) is controlled to produce superior cast iron with "as-cast" tensile strengths as high as 55,000 psi.



Machinery, September, 1937

CENTER OF MACHINE-TOOL EXCELLENCE

**ROCKFORD, ILLINOIS, U.S.A.**

• It's "power-designed" to give you precision production . . . flexible for use on a wide range of work . . . that's why every type of metalworking shop can make profitable use of at least one Mattison Surface Grinder. Its exclusive features mean higher earnings on continuous production, toolroom or maintenance work . . . its extra horsepower and extra rigidity give you more effective wheel use . . . more productive man-hours . . . better returns on capital investment than any other similar machine. There is a table size available for almost every grinding requirement, ranging from 12 x 36 in. to 36 x 192 in. . . . your dealer will be glad to provide complete details and recommendations or to arrange a sample grind on your parts.

**Double column... direct drive... increase stock removal and precision**



Vertical and wheel-slide assemblies are supported on double-column unit by eight bearing surfaces . . . giving extra stability for rapid stock removal . . . precise adjustment and alignment. Wide bearing surfaces on inside face and dovetail bearing surfaces on the front and back assure accurate downfeeds.



**DIRECT MOTOR DRIVE ELIMINATES SPINDLE VIBRATION... GIVES MORE USABLE POWER**

High-powered motor is mounted directly on the wheel spindle eliminating spindle vibration . . . allowing the wheel to meet the work in correct alignment for more accurate quality and increased wheel efficiency. More usable power makes possible higher wheel speeds . . . heavier feeds . . . increased production . . . shorter job times.



**HYDRAULIC DRIVE ASSURES  
POSITIVE FEED...FINE FINISH  
...FULL USE OF POWER**

Easily controlled, highly efficient table drive is provided by the nondifferential twin cylinder hydraulic drive. Equal speed in either direction . . . fully cushioned smooth reversal . . . positive longitudinal travel . . . and variable speeds up to 100 feet or more per minute are made possible by this unit.

**MATTISON MACHINE WORKS**

**ROCKFORD, ILLINOIS**

If it's a flat surface, there's a Mattison to grind it!

**"Setups"**

Informative, actual application reports of unusual grinding operations have been gathered together in an attractive illustrated booklet—available to you free of charge. Ask your dealer for your free copy of "Setups" . . . or write direct.

**MATTISON**  
**HIGH-POWERED**  
**PRECISION**

**GRINDING**  
**METHODS**



**new automatic  
production-type  
honing machines**  
for bores up to 2" diameter

pneumatic  
hone  
expansion

automatic  
bore-to-bore  
sizing

HOLE  
**BARNESDRIL**  
FINISHING

magazine  
loaded

automatic  
ejection

Designated as Models No. 10A1 and 15A2, these new Single Spindle Vertical Honing Machines are an example of complete automation in small size, highly accurate, simple machines as designed by Barnesdril engineers.

These machines feature air-impulse hone expansion with automatic rapid expansion, feed and collapse; automatic bore-to-bore sizing; and hopper loading. Automatic shut-down when stones are worn is also provided. Optionally,

parts can be automatically pre-gauged, honed, post-gauged, sorted and ejected.

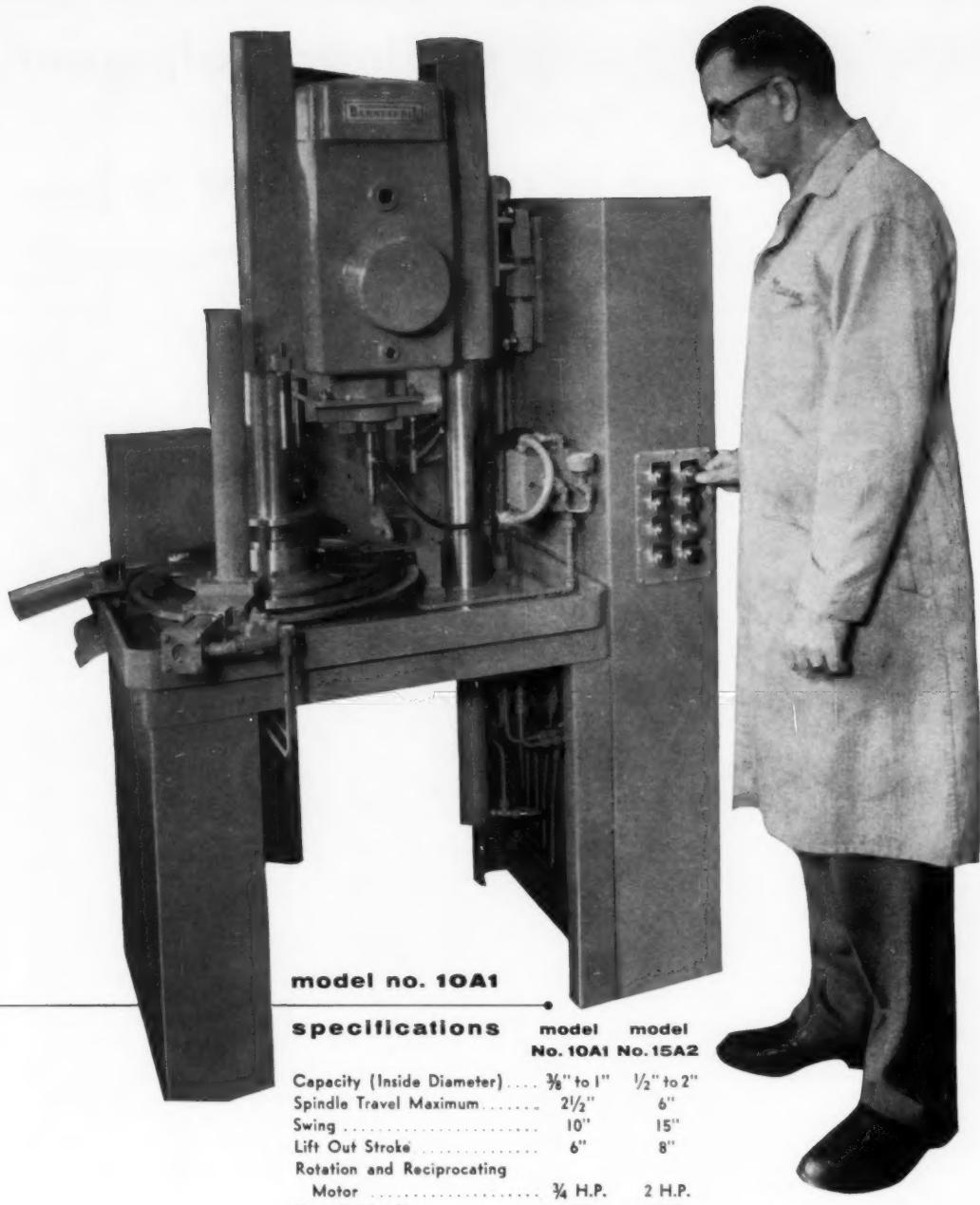
Because these machines have an all mechanical system with a Vee-belt spindle drive, size and cost are minimized and maintenance is greatly reduced. Rigidity and accuracy are further enhanced by suspending the reciprocating head between two columns.

If you have a bore finishing problem, send specifications and requirements for estimates of machines and tools to do the job.



Machinery, September, 1957

CENTER OF MACHINE-TOOL EXCELLENCE **ROCKFORD, ILLINOIS, U.S.A.**



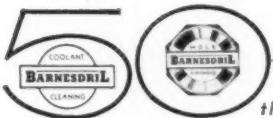
**model no. 10A1**

**specifications**

**model No. 10A1**

**model No. 15A2**

|                                      |                 |                 |
|--------------------------------------|-----------------|-----------------|
| Capacity (Inside Diameter) . . . . . | 3/8" to 1"      | 1/2" to 2"      |
| Spindle Travel Maximum . . . . .     | 2 1/2"          | 6"              |
| Swing . . . . .                      | 10"             | 15"             |
| Lift Out Stroke . . . . .            | 6"              | 8"              |
| Rotation and Reciprocating           |                 |                 |
| Motor . . . . .                      | 3/4 H.P.        | 2 H.P.          |
| Overall Height . . . . .             | 72"             | 88"             |
| Floor Space . . . . .                | 32" x 45"       | 42" x 63"       |
| Net Weight . . . . .                 | 1150 lbs.       | 1650 lbs.       |
| Gross Weight (Crated for             |                 |                 |
| Domestic Shipment) . . . . .         | 1450 lbs.       | 1950 lbs.       |
| Gross Weight (Boxed for              |                 |                 |
| Export Shipment) . . . . .           | 1750 lbs.       | 2250 lbs.       |
| Cubical Area for Export              | 159,600 cu. in. | 162,480 cu. in. |
| Shipment . . . . .                   |                 |                 |



th year

**BARNES DRILL CO.**

820 CHESTNUT STREET • ROCKFORD, ILLINOIS  
DETROIT OFFICE: 3419 South Telegraph Road

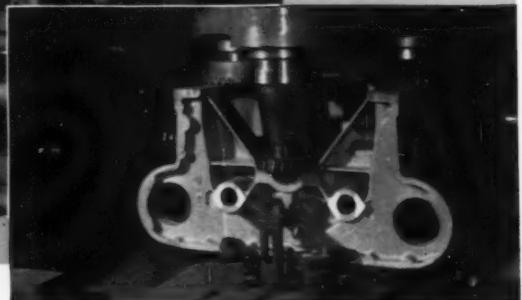
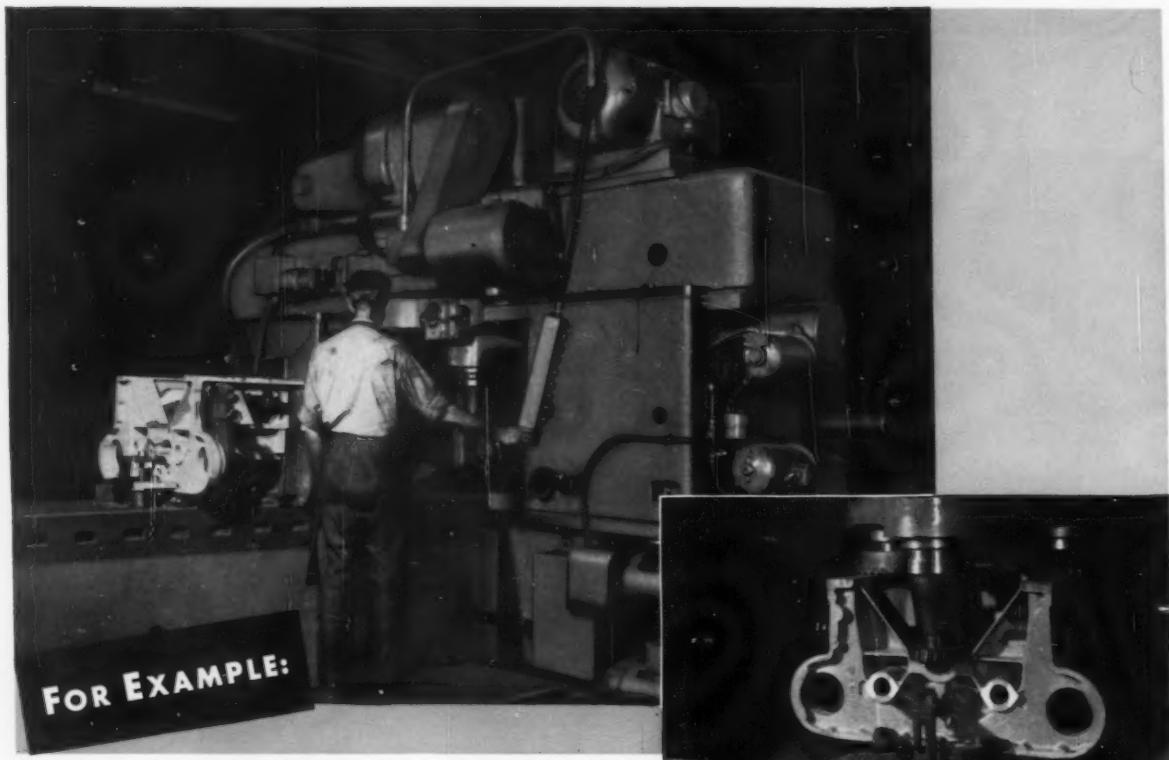
Machinery, September, 1957

CITY OF MACHINE-TOOL SPECIALISTS

**ROCKFORD, ILLINOIS, U.S.A.**



**Before you buy any milling equipment  
see what you get from  
SUNDSTRAND!—**



**This Sundstrand Rigidmil  
Increased Production 25%**

Faster cycling, pushbutton control, improved accuracy and finish due to precise, rigid construction, are major benefits being realized at LeRoi Division, Westinghouse Air Brake Company, Milwaukee, in machining castings for internal combustion engines and compressors on this Rigidmil. Scrap and rework are reduced because the complete processing cycle requires only the depressing of a single pushbutton on the pendant control. Additional versatility is provided by horizontal spindles on the columns that insure economical and accurate machining of parts with opposed faces.

Sundstrand "Engineered Production" can improve production and quality on your job, too, by providing

This Sundstrand Rigidmil has horizontal spindles for machining opposed faces and a three-spindle head on crossrail for machining different crankcase surfaces.

you with the machines and processing techniques required to handle your products most efficiently. Because Sundstrand builds a complete range of milling machines, as shown by a few examples on the facing page, you can be sure that you are getting the one best machine for your needs.

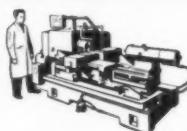
All the factors—economic as well as technical—are carefully analyzed by Sundstrand process and design engineers before a machine recommendation is made. Automotive, aircraft, farm implement, tractor, and railroad equipment plants are among those meeting exacting production standards on long-run or small-lot jobs with a big assist from Sundstrand "Engineered Production!"

**SUNDSTRAND**

**"Engineered  
Production"  
Service\***

\*REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

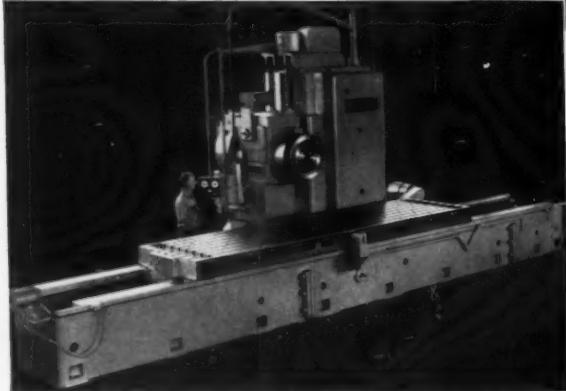
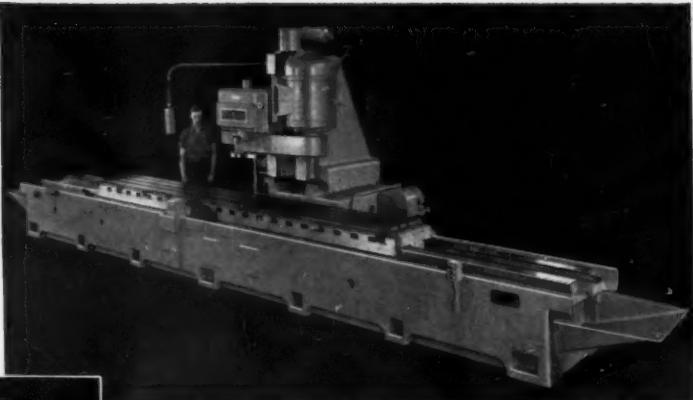


MACHINES DESIGNED TO MEET YOUR NEEDS

**ROCKFORD, ILLINOIS, U.S.A.**



Show here are a few of the standard machines that can solve your milling problems when applied with Sundstrand "Engineered Production."



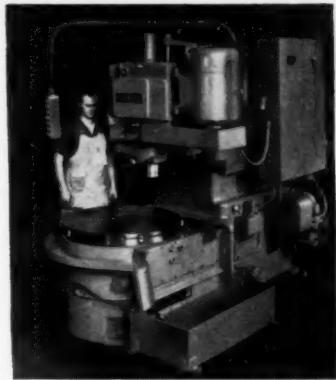
SIMPLEX RIGIDMILS—Table feed strokes ranging from 24" to 216" and spindle motors from 3 to 100 hp permit picking the ideal machine for widely varied materials and sizes of cutters.

DUPLEX RIGIDMILS—Fixed or adjustable column types enable opposed faces to be machined with maximum accuracy and economy. Adjustable column machines mount spindle heads on movable columns for cutting rigidity over wide work range.

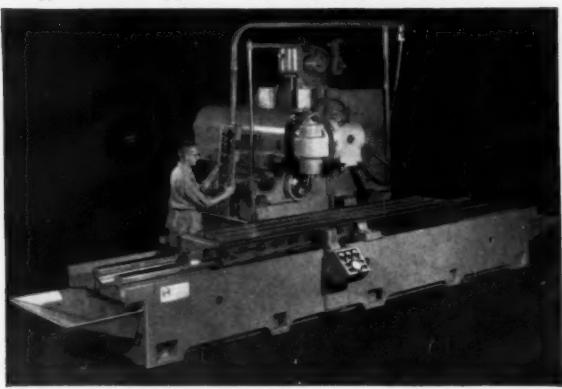
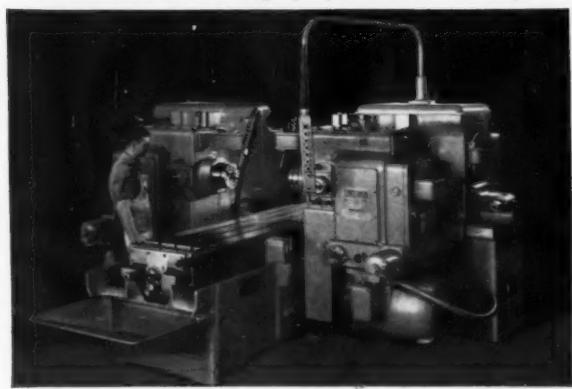
VERTICAL RIGIDMIL—Power vertical adjustment to spindle head, endwise quill adjustment, and cross adjustment to spindle head carrier are features contributing to easy adjustment and simple setup over a wide work range.

ROTARY TABLE  
RIGIDMIL—

Way-type cross adjustment of spindle head carrier and way-type vertical adjustment to spindle head provide maximum support to cutter for large or small parts.



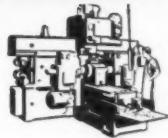
UNIVERSAL RIGIDMIL—Recent addition to Rigidmil line, the universal bed-type machine, has both a horizontal spindle head and an all-angle, ram-type head making possible wide range of cuts at all angles.



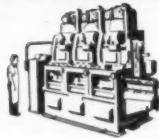
Additional Facts on how "Engineered Production" is applied to the complete line of Sundstrand Machine Tools is available in Bulletin 683. Write for your copy today.



TRIPLEX RIGIDMILS



SPECIAL MACHINES



**SUNDSTRAND**  
**Machine Tool Co.**

2530 Eleventh St. • Rockford, Ill., U.S.A.



# SIX GREENLEE'S ON THIS TEAM



WRITE FOR  
COMPLETE INFORMATION

## Leading Auto Manufacturer Selects 6 Greenlee Transfer Machines For V-8 Engine Block Precision Machining Line

The entire installation has 127 stations and a machined block comes off the line at each cycle. This first unit drills and reams locating holes, mills main bearings to width; mills lock slots, oil seal and slinger grooves, fuel pump and filter pads and rough bores cylinders. It also has a gauging station to check locating holes, a reject station and three turnover stations, the last of which positions the block for the next machine.

**GREENLEE**  
BROS. & CO.

1869 MASON AVENUE  
ROCKFORD, ILLINOIS



MACHINES DESIGNED TO MEET YOUR NEEDS

**ROCKFORD, ILLINOIS, U.S.A.**

*Completely  
Oil-Sealed!*

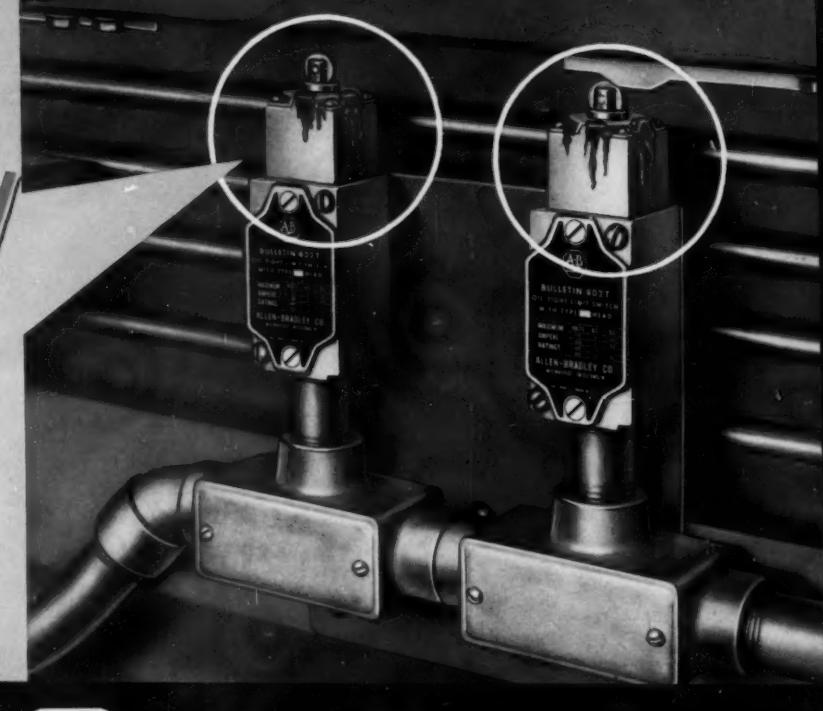


**SEALED HEAD KEEPS OUT  
OIL, COOLANT, METAL CHIPS**  
**... your guarantee of  
reliable limit switch operation!**

With *completely sealed* operating heads, as well as sealed switch bodies, Allen-Bradley Bulletin 802T oiltight limit switches provide maximum reliability in limit switch operation for your modern, high speed production machines. The sealed head excludes oil, dirt, and metal chips from the operating mechanism . . . the spring return, momentary contact operators cannot become sluggish and stick.

The maintenance free, double break, silver alloy contacts are sealed in the oiltight body. Interchangeable operating heads are available with various push rods and levers which can be mounted in any one of four positions. Oiltight transparent plastic covers, for inspecting contacts and wiring without removing the cover, are available for most units.

Here's a line of *quality* limit switches in which each type will provide millions of trouble free operations. Have your A-B control engineer acquaint you with this latest development—another advance in limit switch design.



802TC Side Push Rod Type



802TF Red Type



802TA Roller Lever Type



802TB Top Push Rod Type with Plastic Window



802TAO Roller Lever Type for Cavity Mounting



802TG Adjustable Roller Lever Type

**ALLEN-BRADLEY**  
MOTOR CONTROL  
QUALITY

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.  
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

# NOW... ALLEN-BRADLEY

## PRECISION-TYPE LIMIT SWITCHES

### ARE ALSO **OILTIGHT!**



#### **OILTIGHT HEAD**

Newly designed head on push type seals out oil. Roller lever types have sealed operating shafts.

#### **OILTIGHT BODY**

Synthetic rubber gasket between housing and plate excludes oil and coolant from operating mechanism.

Allen-Bradley precision-type limit switches combine very close operating tolerances with such a sturdy construction that they can be used for any industrial application. Now this line of limit switches has been further improved by making them completely oiltight.

Especially designed for use where the motion to operate the limit switch is measured in thousandths of an inch, these Allen-Bradley limit switches can henceforth be employed in applications where oils, coolants, and dust are present.

Allen-Bradley Bulletin 802 oiltight precision limit switches have a positive snap action mechanism which prevents any possibility of a "dead center" . . . no matter how slowly the actuating force is applied. They are available in both the spring return and maintained contact construction. And all have maintenance free, double break, silver alloy contacts.

Specify these Allen-Bradley oiltight limit switches where "precision" operation is required and where dirt and oil could cause trouble.



Push rod type. Plastic cover, for inspection without removing cover, made for most units.



Roller lever type limit switch with lever on right side. Also available with lever on left side.



Roller lever precision-type limit switch with roller lever in front of the switch body.

#### **ALSO—GENERAL PURPOSE LIMIT SWITCHES**



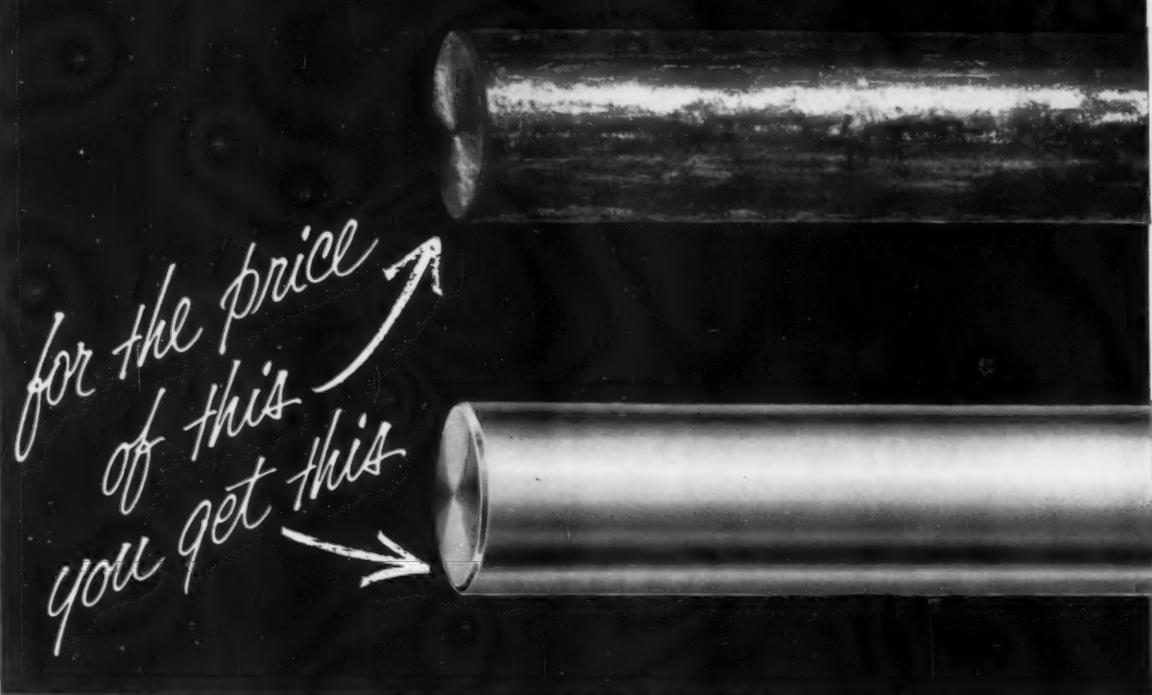
Bulletin 801 general purpose limit switches in standard or heavy duty ratings. Maintained or momentary contacts with slow or snap action. Silver alloy contacts used throughout this line.

**ALLEN-BRADLEY**  
**MOTOR CONTROL**  
**QUALITY**

Allen-Bradley Co.  
1316 S. Second St., Milwaukee 4, Wis.  
In Canada—  
Allen-Bradley Canada Ltd., Galt, Ont.



Now, all former hot rolled  
Crucible REX high speed rounds  
supplied with a new thrift finish



Here's a revolutionary, new Crucible policy designed to provide an improved product—save time and processing costs. Now, Crucible furnishes all REX® high speed rounds from  $\frac{5}{8}$ " up with a machined surface, close to size and free from decarburization. All bars from  $\frac{1}{4}$ " to  $\frac{5}{8}$ " round are supplied cold finished.

This new *thrift* finish means important savings to you — whether you've been paying extra for decarburization and stock removal, or grinding or rough turning rounds in your own shop. Of course, where extremely close tolerances are demanded, precise centerless grinding is still available at a small extra.

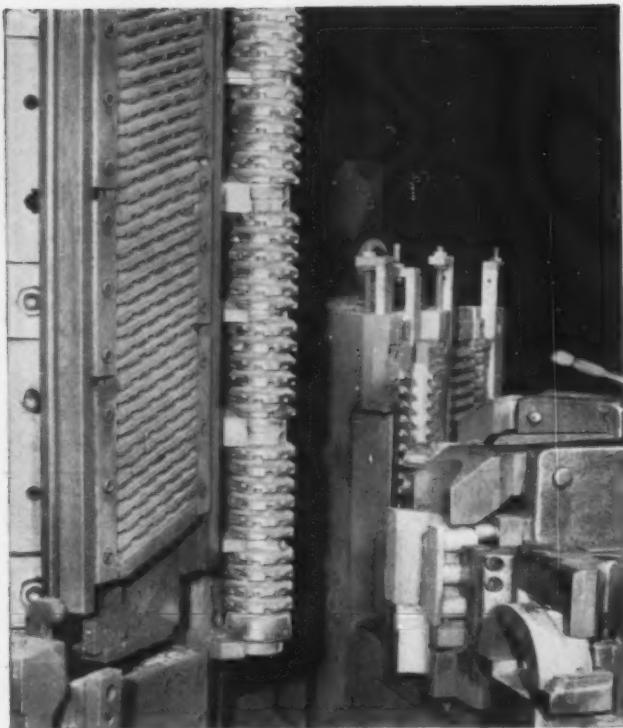
It's another Crucible "first" that offers you substantially more for your high speed steel dollar. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

**CRUCIBLE**

first name in special purpose steels

**Crucible Steel Company of America**

Canadian Distributor — Railway & Power Engineering Corp., Ltd.



←  
**Grade 883 increases  
broach life 2500%**

Highly abrasive cast iron used for this bearing cap at Studebaker caused conventional broaches to fail after maximum run of only 3,600 parts. After the switch to Grade 883, initial broach ran 50 days, produced 90,000 parts without service. Over-all machining costs were reduced 22%.

→  
**Grade 370 saves 155  
hours' machining time**

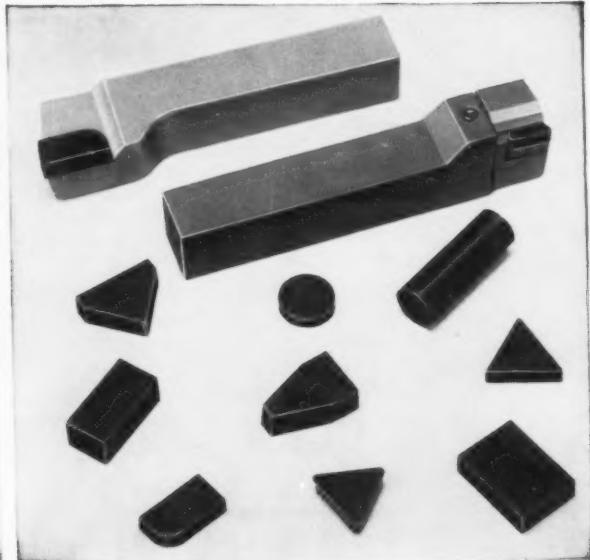
Normal machining time on this 165-ton cast-steel propeller runner at S. Morgan Smith Co. was 220 hours. Despite abrasive patches, and interrupted cuts, Grade 370 cut machining time to 65 hours —  $\frac{1}{3}$  the time. At 154 fpm, Grade 370 ran 30 hours without changing — compared to 6-8 hours with previous tools.

## **WHY MACHINE OUTPUT GOES UP, WITH CARBOLOY® CARBIDES ON**



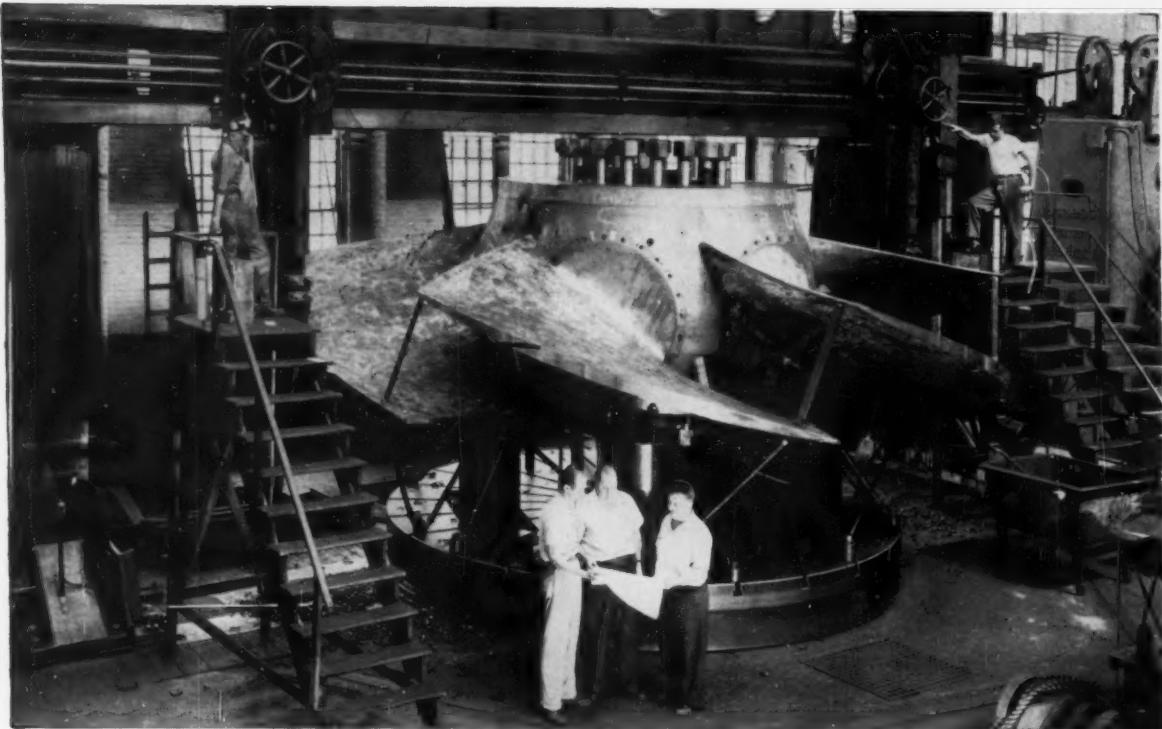
**Grades for cutting every material**

Eleven grades to choose from: 300 Series and 78 Series carbides for cutting steel; new Grade 860 for cast iron; five grades for nonferrous machining.



**. . . in a form for handling every job**

Standard tools in thirteen styles, hundreds of sizes; standard blanks in wide range of styles and sizes. Inserts for Carboloy toolholders or other standard types.



## AND UNIT COST COMES DOWN, YOUR METALCUTTING JOBS

- Carboloy cemented carbides are tailored to the job
- Let you cut faster without sacrificing tool life

You'll increase the productivity of your machines, while you reduce total manufacturing cost per piece, when Carboloy cemented carbides go to work on your jobs.

Your machines will be more productive, because they can operate at greater speeds and feeds when tooled with the Carboloy grade designed for the job. And they'll produce more per shift, because Carboloy carbides take rugged machining conditions without sacrifice of tool life.

Your units costs will go down, because the use of these grades means less machining time per piece . . . with lower downtime expense, reduced grinding and maintenance charges.

### Proved in the field

Hundreds of implant case histories like the two shown above prove Carboloy cemented carbides can double and triple output, save thousands of dollars per year in machine time, manpower, and tool costs.

The reason is simple. Each Carboloy carbide grade has cutting characteristics tailored to a particular type of job. Whether you're machining ferrous or nonferrous metals, whether you're taking heavy or finishing cuts . . . one of the eleven Carboloy carbide grades handles

the job. And you can quickly get the grade you need, in the form you need it.

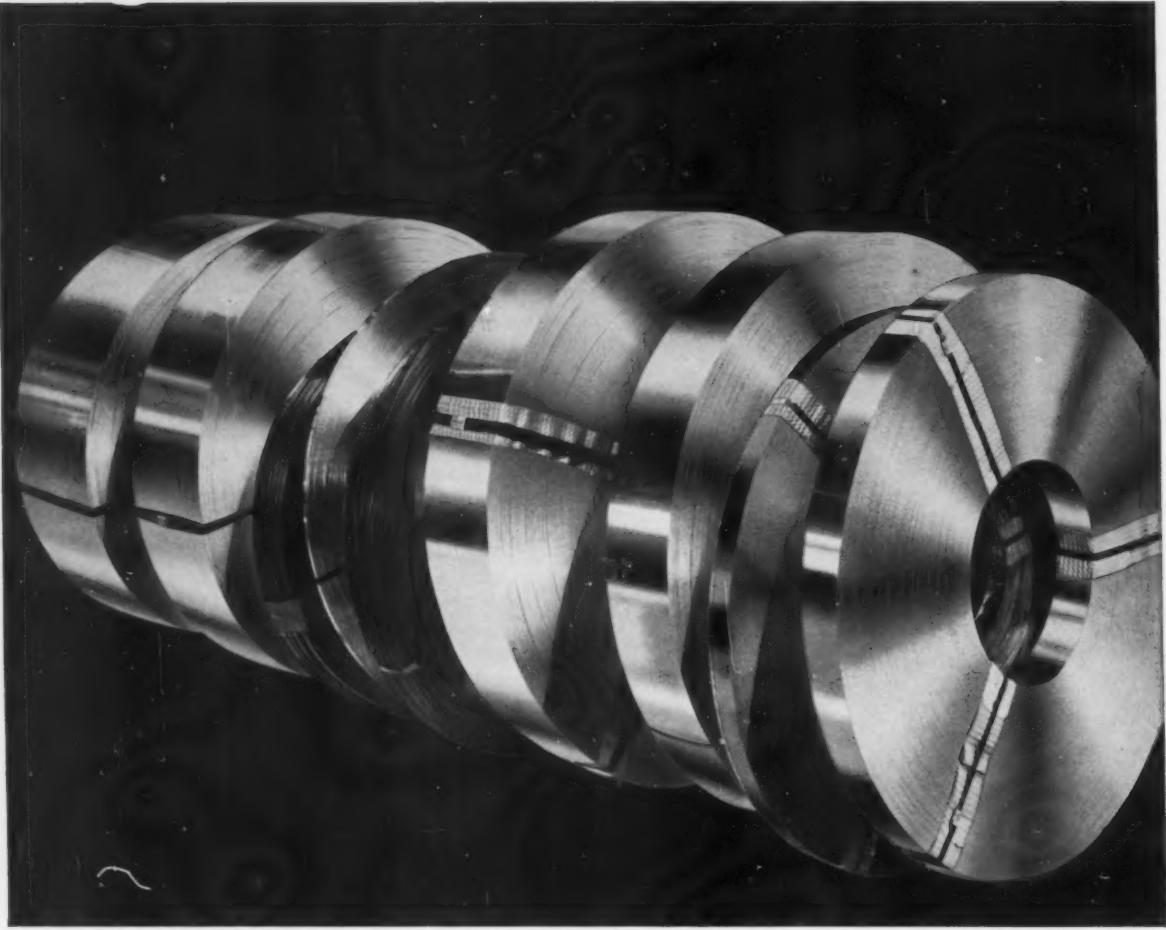
### Stocked locally by Carboloy Distributors

Your local Authorized Distributor of Carboloy cemented carbide products stocks standard tools, blanks, inserts, and toolholders in styles and sizes for every job or machine. He'll give you fast delivery, and expert technical assistance.

Call him today (you'll find his name in the Yellow Pages of your phone book). Or write: Metallurgical Products Department of General Electric Company, 11147 E. 8 Mile Blvd., Detroit 32, Michigan.

**CARBOLLOY®**  
CEMENTED CARBIDES

**GENERAL ELECTRIC**



**it's CRUCIBLE**  
**for the widest assortment**  
**of cold rolled specialty steels**

Crucible has the largest assortment of cold rolled specialty steels you'll find anywhere. And delivery is dependable—in the size, grade, gauge, or analysis you want.

What's more, Crucible's steelmaking experience—its improved mill facilities—combine to bring you cold rolled steels of optimum uniformity... finer finish... better edges... flatter strip.

No need to shop around—call Crucible for carbon spring steel, alloy strip steel, or any ferrous analysis that can be cold rolled. For more information, write now for your copy of the 32-page booklet, "Cold Rolled Specialty Steels". *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

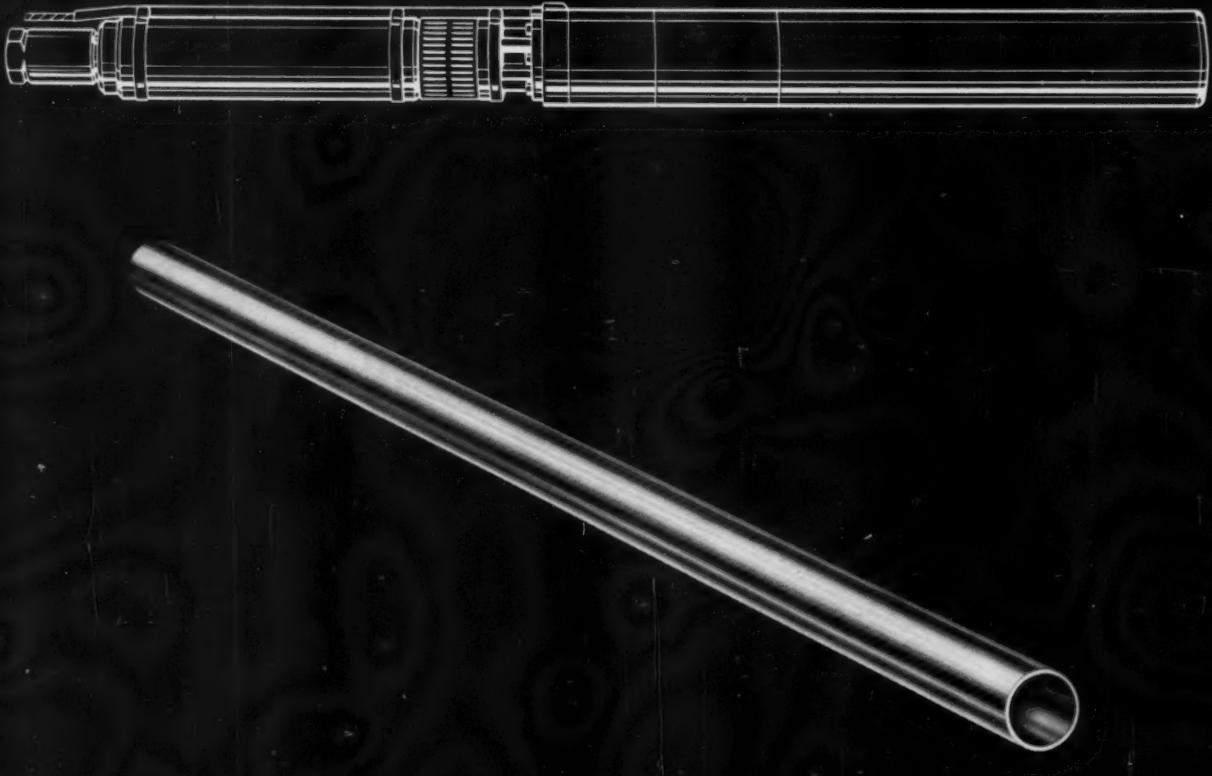
**CRUCIBLE**

first name in special purpose steels

**Crucible Steel Company of America**

104—MACHINERY, September, 1957

For more information fill in page number on Inquiry Card, on page 255



## B&W ERW Mechanical Tubing Saves Time, Cuts Pump Production Costs 50%!

One manufacturer of submersible pumps had a bottleneck in its production line. The company had been using seamless tubing for their motor housings and pump housings—the design of the units called for precision tubing with close I.D. tolerances.

The company turned to B&W Electric-Resistance-Welded Mechanical Tubing.

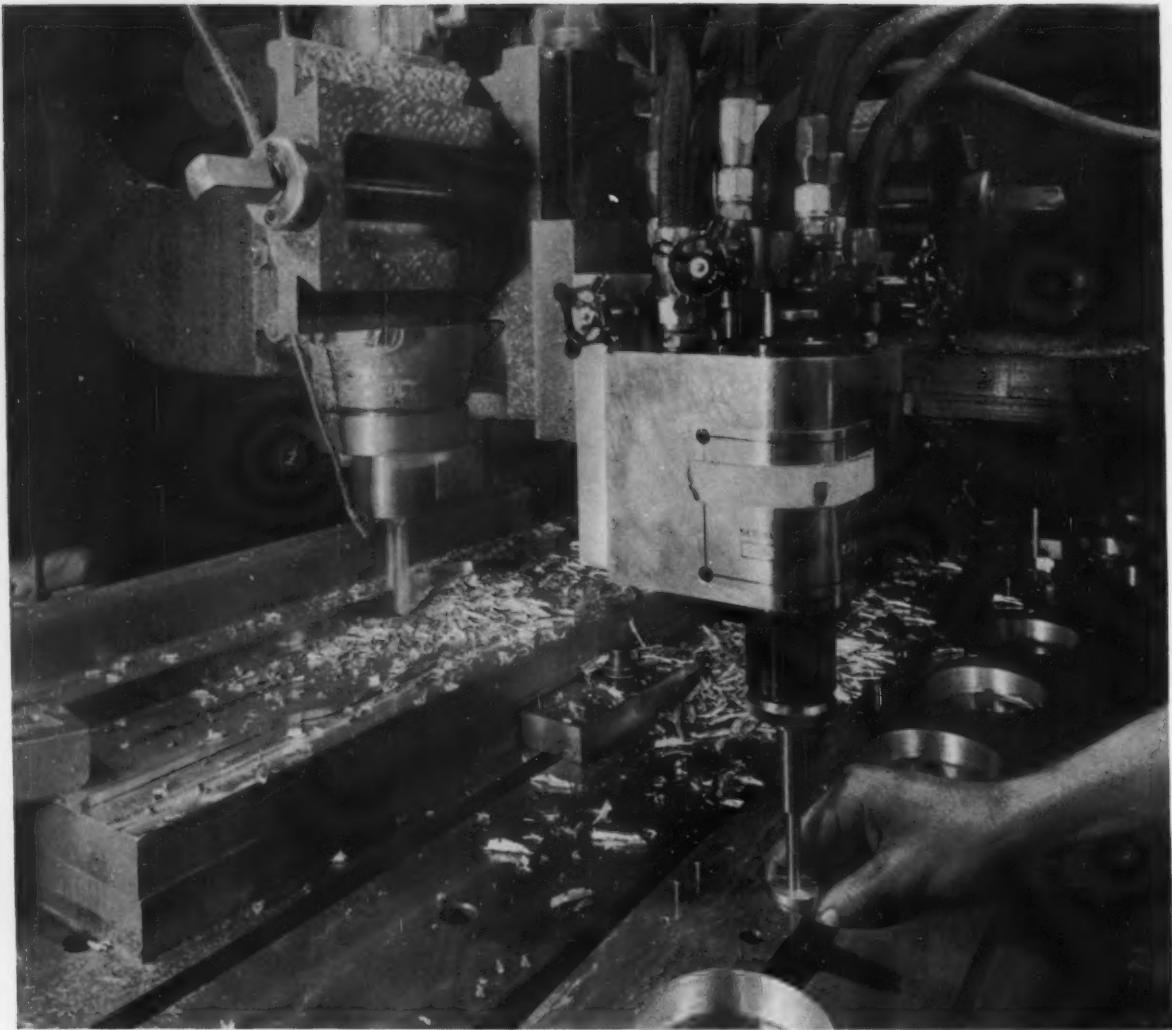
After two years of using this close tolerance tubing, company engineers estimate they have been able to reduce their production costs on the components as much as 50%. What's more, the production of these parts has become the least troublesome in the manufacturing process!

Here's another example pointing out where B&W ERW Tubing is being used by industry to produce better products at lower cost. B&W Mechanical Tubing is available in a wide range of sizes, shapes, analyses, and finishes.

Get all the facts on savings from Mr. Tubes, your link to B&W. Call your local B&W tubing distributor. Write for Bulletin TB-419. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pa.



TA-6088-M4



TRACING STYLUS (right) being used on highly accurate magnesium template in profiling operation at American Tapered Wings, Inc.

## "Low cost, easy to handle magnesium is an ideal choice for our profile templates"

"We first began using magnesium tooling plate in February, 1956," reports Harold Redpath, Executive V.P. of American Tapered Wings, Inc., Los Angeles.

"We found it entirely practical from the standpoint of strength, and it is lighter, easier to handle and less expensive than either aluminum or steel . . . permits individual workers to move units without using overhead cranes or fork lifts. We used about 7,000 lbs. of magnesium in 1956, saving about \$2,000 in tooling metal costs.

"We have been using many of our magnesium templates nine months to a year, profiling aluminum forgings which serve as wing spars, vertical fin spars and longerons. We also use magnesium tooling plate for making many of our drill jigs and milling fixtures."

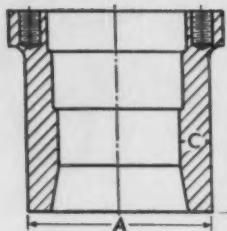
For more information on low cost, lightweight, easily machined magnesium tooling plate, contact your nearest supplier of Dow magnesium. Or write to THE DOW CHEMICAL COMPANY, Midland, Mich., Department MA 1417Y.

AVAILABLE FROM STOCK AT: Copper and Brass Sales, Inc., Detroit, Michigan • Fullerton Steel and Wire Co., Chicago, Ill. • Hubbell Metals Inc., St. Louis, Mo. • A. R. Purdy Co., Inc., Lyndhurst, N. J. Reliance Magnesium Co., Los Angeles, Calif. • Vinson Steel and Aluminum Co., Dallas, Texas.

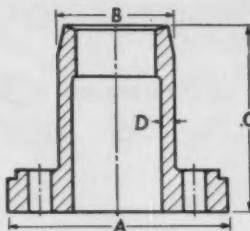
YOU CAN DEPEND ON



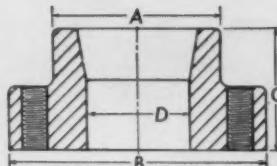
# *Do you make ring-shaped tool steel parts like these?*



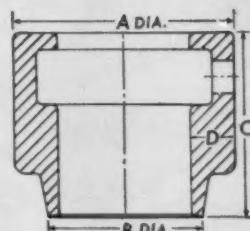
BLANKING AND  
FORMING PUNCH



FORMING AND  
PIERCING DIE



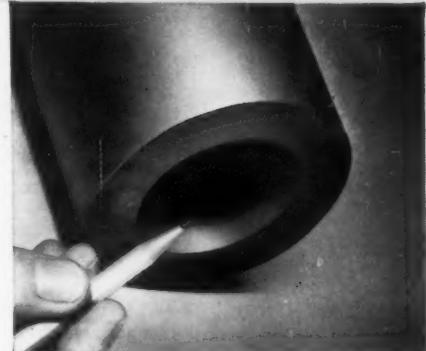
SIZING  
DIE



SIZING  
SLEEVE

**Graph-Mo Hollow-Bar® can cut your costs because the hole's already there**

*Eliminates drilling, machines faster*



**Y**OU start with finish boring when you use Graph-Mo Hollow-Bar®. The hole's already there! Because drilling is eliminated, you cut costs and speed production. And you get a tool steel that machines faster, wears longer, gives more stability.

Graph-Mo machines faster than ordinary tool steels because of the free graphite in its structure. And there's far less tendency to pick up, scuff or gall.

Reports from users show that Graph-Mo outwears other tool steels three to one on the average. That's because of the combination of free graphite and diamond-hard carbides in Graph-Mo's structure.

And you won't find a more stable tool steel than Graph-Mo. Proof: after 12 years of use, a master plug gauge machined from Graph-Mo showed less than 10 millionths of an inch dimensional change.

Specify new Graph-Mo Hollow-Bar for all your ring-shaped tool steel parts. You'll save time and money, have a better finished product. It's available in O.D. from 3 to 16 inches with many wall thicknesses.

For more information write: The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable: "TIMROSCO".

# **TIMKEN STEEL**

FINE ALLOY

TRADE-MARK REG. U.S. PAT. OFF.

**SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING**

See the first Timken Televent hour, in color, "Eleven against the ice—story of the Antarctica Turnpike". NBC-TV, Monday night, Sept. 23rd.

For more information fill in page number on Inquiry Card, on page 255

MACHINERY, September, 1957—107

**DO YOU  
NEED BETTER WAYS  
TO STRIP PAINT?**

**CAN YOU USE  
A STRIPPER FOR EPONS?**

**When tough finishes  
resist your present stripping methods,  
you may need our help.**

*If your problem is in this column*

*See note below*

How to remove epon lacquers, paints and enamels.

**A**

How to strip paint, pigment residues, phosphate coatings, rust and oil in one operation.

**B**

How to strip paint from rejects, conveyor chains, racks and hooks in continuous operation.

**B**

How to strip oil-base paints . . . synthetic enamels . . . alkali-resistant plastics . . . resin-base paints . . . japans . . . wrinkle finishes . . . nitrocellulose lacquers . . . alkyds . . . phenolics . . . ureas

**C**

How to strip zinc chromate primers without etching aluminum.

**C**

How to strip paint from vertical surfaces and undersurfaces where thin-bodied strippers run off without stripping

**C**

How to strip metal parts that are too large to be soaked in tanks.

**C**



**FREE** For full information  
on your problems, ask for:

A—Bulletin B-6530 "Oakite Stripper S-A".

B—Booklet "Here's the best shortcut in the field of organic finishing".

C—Booklet "How to STRIP PAINT".



Technical Service Representatives in  
Principal Cities of U. S. and Canada.

Export Division Cable Address: Oakite

Write to Oakite Products, Inc., 26 Rector St., New York 6, N. Y.

For more information fill in page number on Inquiry Card, on page 255



# Need Seamless Steel Tubing Immediately?



**Get "out-of-stock" delivery  
Call your USS Shelby  
Seamless Distributor!**

**W**HY WAIT FOR DELIVERY when you can get all the top-quality Seamless Steel Tubing you need from your close-at-hand USS Shelby Seamless distributor?

Phone him, write him, drop in and see him—and you'll get prompt, courteous and efficient service, the likes of which you've never seen before.

• The consistent high quality of USS Shelby Seamless Tubing, its dimensional accuracy and superior machining char-

acteristics make it easy to fabricate. Use it and cut tool costs, reduce rejects, save both time and money, and turn out a finer product.

- Shelby Seamless is available in round, square, rectangular, and other special shapes in any commercial size—from  $\frac{1}{4}$ " OD to  $10\frac{1}{4}$ " OD and in wall thicknesses from .035" to 2.000" ... in a wide range of steel grades and anneals.

— Contact your Shelby Seamless Distributor now! —

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.

(*Tubing Specialties*)

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS  
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



**SHELBY SEAMLESS MECHANICAL TUBING**



UNITED STATES STEEL



## **From a Sound Blank Comes a Sound Finished Product**

One of the best ways to insure top quality in finished circular products is to insist on sound, reliable blanks. You have this assurance when your specifications call for Bethlehem blanks, which are unsurpassed anywhere.

These sturdy steel pieces are made in a two-way mill that combines the steps of forging and rolling. Blanks produced in this mill have uniformity and good grain flow. They are very strong; hence thinner sections can often be used. And their internal structure is so dependable that machining can be done with confidence. There is no hidden trouble lurking beneath the surface of the metal.

Bethlehem forged-and-rolled blanks are widely

used in the making of gears, crane and industrial wheels, sheave wheels, flywheels, brake drums, turbine rotors, pipe flanges, and other circular products. They are available in a wide range of sections, and in sizes from 10 to 46 in. OD. Orders can be furnished heat-treated or untreated.

We suggest you get full details from the nearest Bethlehem office. Or write for a copy of Booklet 216, which contains many interesting facts and more than 80 photographs.

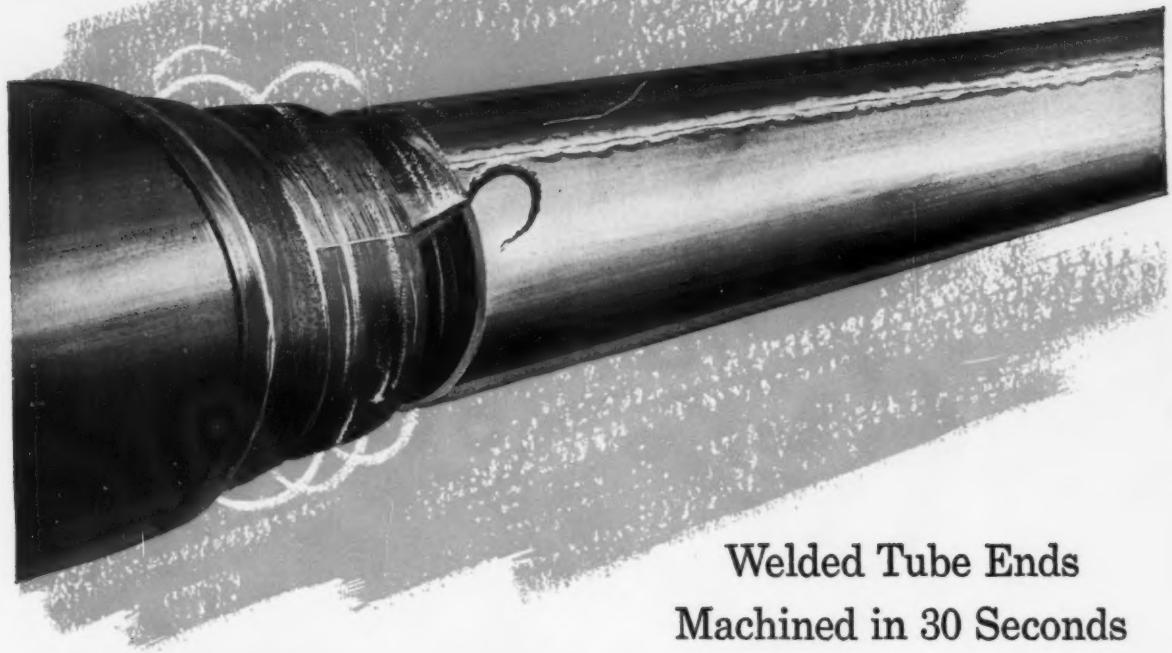
**BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.**

On the Pacific Coast Bethlehem products are sold by  
Bethlehem Pacific Coast Steel Corporation  
Export Distributor: Bethlehem Steel Export Corporation

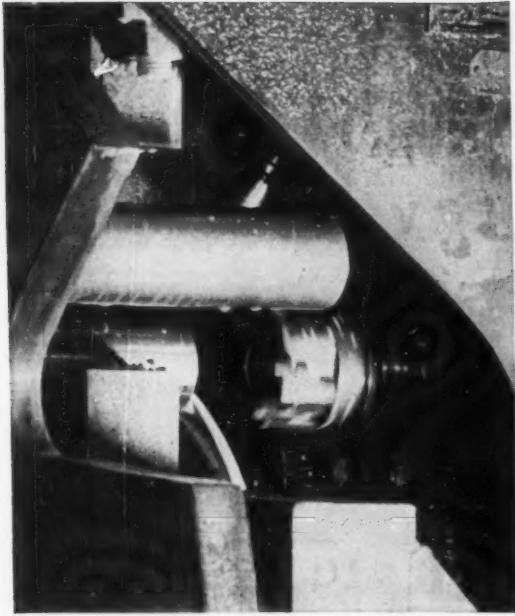
**BETHLEHEM STEEL**



## HAYNES Alloys Solve the Tough Machining Problems



### Welded Tube Ends Machined in 30 Seconds



No down-time or interference with production while making an interrupted cut on thin welded tubing. 37 tubes are machined per hour in automatic set-up.

HAYNES STELLITE alloy tools are standard equipment on an automatic set-up for machining the ends of very thin, welded tubing. The tools are tough enough to operate for long periods of time under difficult machining conditions.

The tube ends are thin and tend to vibrate . . . the welded seam creates an interrupted cut on every revolution . . . and the cutting tool edge must remain sharp to make a clean cut without damaging the tube ends. Other tools tried on this application either mushroomed the tube ends, or failed by chipping. Only HAYNES STELLITE tools have handled the operation successfully in an automatic set-up.

For complete information on the unusual characteristics of HAYNES STELLITE Metal-Cutting tools, ask for our 16-page booklet. Write Haynes Stellite Company, Kokomo, Indiana.



# HAYNES ALLOYS

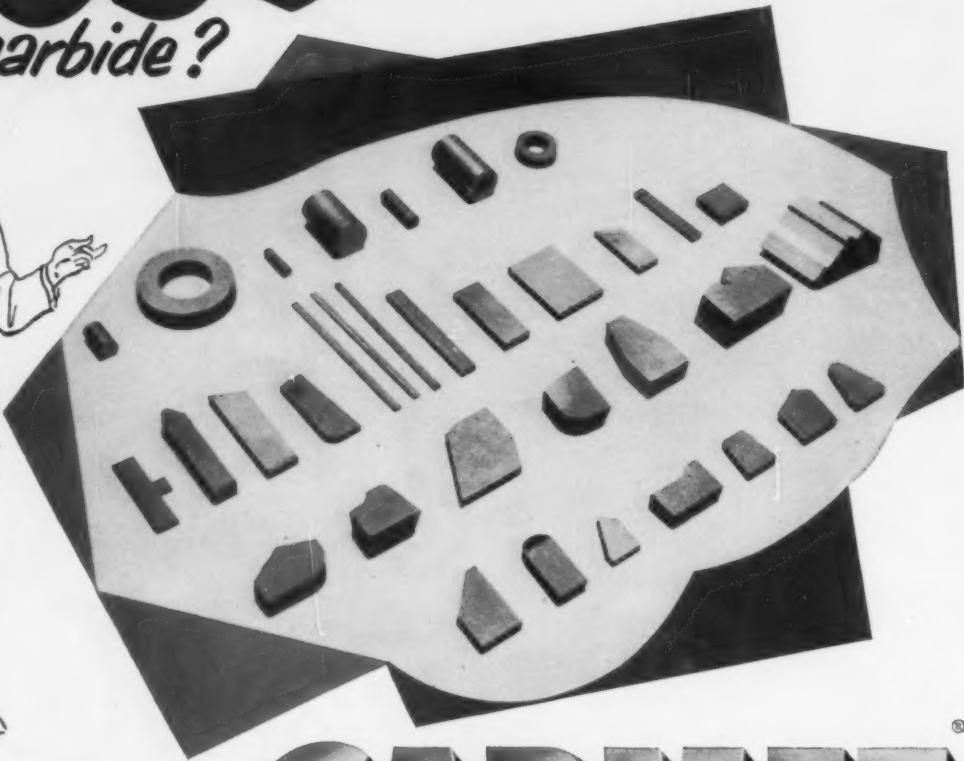
HAYNES STELLITE COMPANY

Division of Union Carbide Corporation  
Kokomo, Indiana



"Haynes" and "Haynes Stellite" are registered trade-marks of Union Carbide Corporation.

Need **OOD** shapes and sizes  
of carbide?



We press or preform

to your designs in

# CARMET®

to save you expensive grinding!

**GET THE NEW  
CARMET  
CATALOG**

Just out . . . 32 well-illustrated pages, containing data on all Carmet grades, and on Carmet blanks, tools, die sections, punches, draw die inserts, etc.; also special preforming to order. • Write for your copy.

ADDRESS DEPT. M-93

When the exact shape and size of Tip you need is not to be found in carbide producers' catalogs, what should you do?—(1) order the Tips that seem to be adaptable, and then go to the expense of grinding them down to suit—or (2) ask CARMET to build you a die that presses the Tips to your designs? The answer is obvious! Save costly grinding.

For nearest representative, consult Yellow Section of your telephone book.

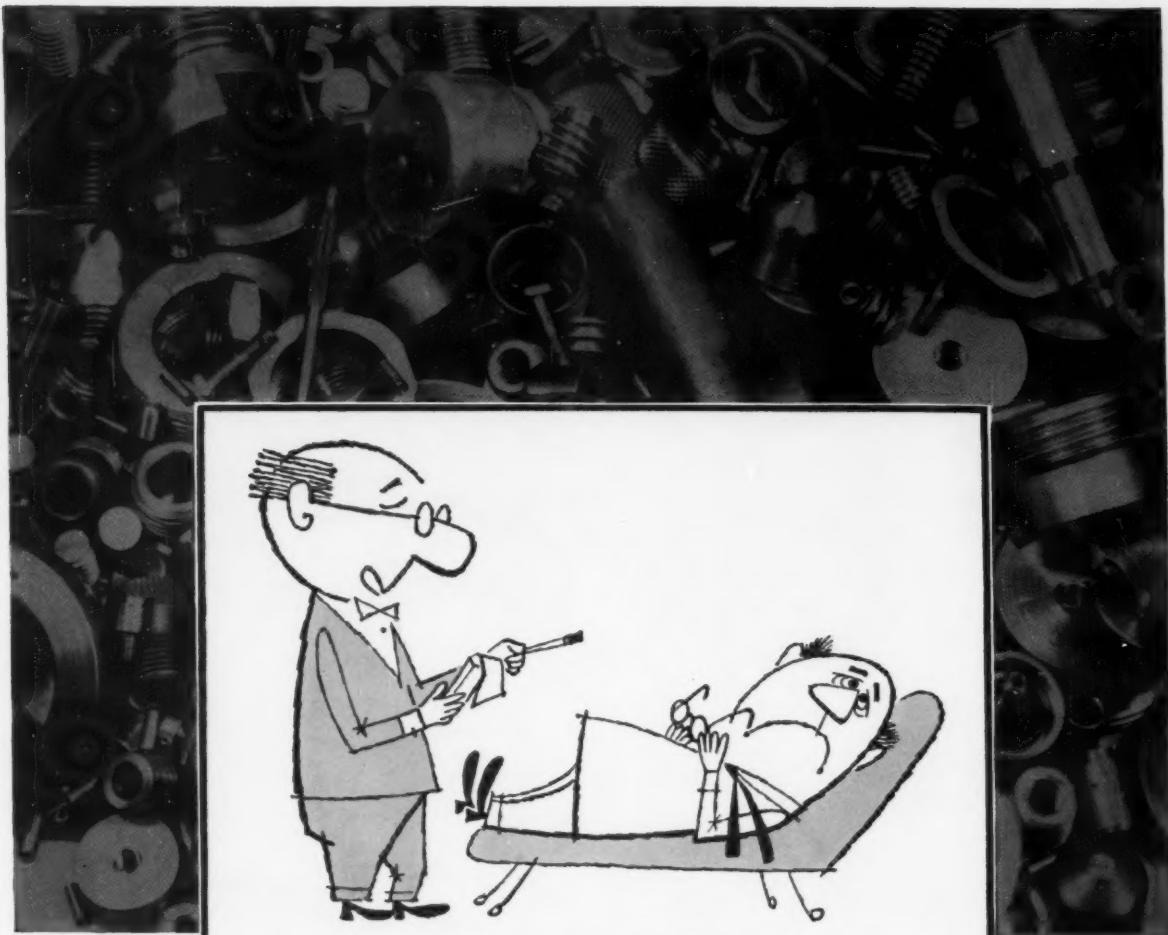
For ALL your CARBIDE needs, call

# Allegheny Ludlum

Each one of the designs pictured above was pressed or preformed by us in quantity to the specific requirements of some individual customer. No excess metal remained for costly removal.

For suggestions, call or write your nearest A-L representative. *Allegheny Ludlum Steel Corporation, Carmet Div., Wanda & Jarvis Aves., Detroit 20, Mich.*





*"There's nothing wrong with you, Mr. Abernathy,  
that a switch to MX won't cure"*

Are you suffering from high production costs? Low tool life? A rise in rejects? Or a falling off in finish? USS MX Free-Machining Steel offers a sure cure for these depressing conditions.

With this faster-cutting bar stock you not only can produce more parts per hour but you'll turn out better parts. Better in finish, more accurate in dimension, lower in cost. Tool life will be longer. You'll have fewer rejects to cut into your profits. It's been proved in shops where USS MX has been put to work.

Such highly desirable results are

obtained with MX Steel primarily because of its superior machinability. Also because this steel is consistently uniform in shipment after shipment. Uniform in cutting characteristics. Uniform in its composition. Uniform in freedom from injurious imperfections.

USS MX Steel works *with* your tools, not against them. That's why, on many jobs, tools have lasted up to 200% longer, cutting speeds have increased as much as 50%, output has been boosted an average of 40%. And remember, with all these advantages, *MX Steel costs no more*

*than ordinary screw stock.*

Available in both Bessemer and Open Hearth grades, USS MX Free-Machining Steel is produced in all the popular screw stock sizes. It is sold in cold-finished form by your regular supplier, under either our trademark "MX" or his own identifying mark. In hot-rolled form, MX Steel is available through our nearest sales office.

UNITED STATES STEEL CORPORATION, PITTSBURGH  
AMERICAN STEEL & WIRE DIVISION, CLEVELAND  
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO  
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.

UNITED STATES STEEL SUPPLY DIVISION  
WAREHOUSE DISTRIBUTORS, COAST-TO-COAST  
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

**Bigger output... longer tool life... lower costs**



**—when you do the job with free-machining**

**MX**

Registered trademark

**UNITED STATES STEEL**



10% faster  
Carpenter No. 5



Rejects down 25%  
Carpenter No. 5



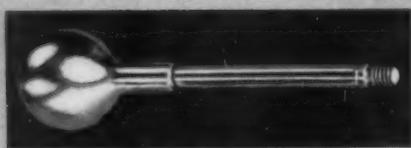
18% more production  
Carpenter No. 8



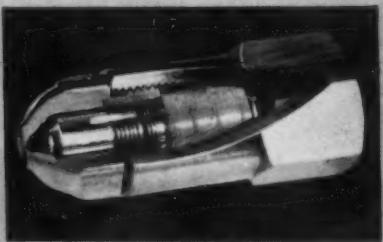
5 to 10% faster  
Carpenter No. 8



Machining cost cut 50%  
Carpenter No. 8



10% fewer rejects  
Carpenter No. 8



Rejects down from 10% to 1/2%  
Carpenter No. 5-F

## More profitable production... the No. 1 benefit of *Carpenter stainless*

Free-Machining Stainless Steels by Carpenter start to prove their superiority right from the first production records. Seven of the eight examples in the illustration had a chance to use other steels first, then switched to Carpenter. The other used Carpenter first, then substituted another steel during emergency. He was quick to return to Carpenter.

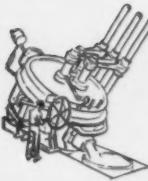
Availability? Never Better! You can depend on rush delivery of Stainless No. 5 and No. 8 from your Carpenter Mill-Branch Warehouse, Office or Distributor. Build more profit into your production with Carpenter Free-Machining Stainless Steels.



# *Carpenter* STEEL

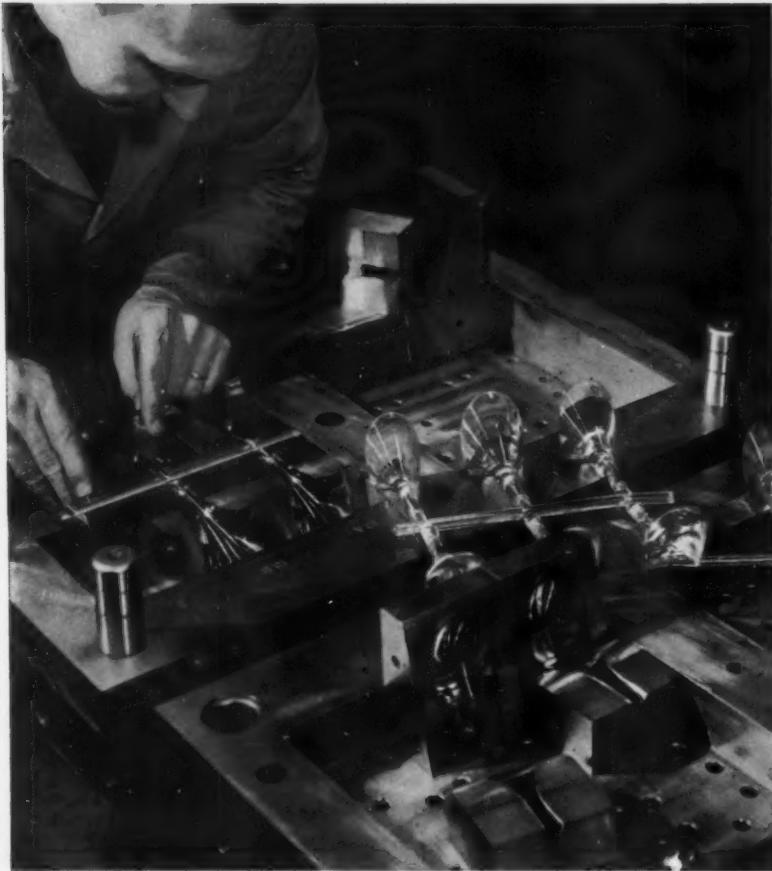
Free-Machining Stainless Steels

The Carpenter Steel Company, 105 W. Bern St., Reading, Pa.  
Export Dept.: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"



# Tool Steel Topics

BETHLEHEM  
STEEL



## Injection Mold of Lustre-Die Makes Plastic Heels That Are Just So!

Here was the problem: to find a tool steel grade which would machine economically, have high mechanical properties, and still have the ability to take the high polish required for producing slick, eye-stopper heels of butyrate and lucite, for women's shoes.

The answer: Bethlehem Lustre-Die tool steel. This was the steel used by Charles Zapf & Company, Evanston, Ill., in producing the injection mold illustrated above. The steel was furnished by Peninsular Steel Co., our local tool steel distributor. According to Missouri Wood Heel Co., St. Louis, who produced the heels, it met every requirement with plenty to spare.

Lustre-Die is an ideal steel for making

plastic parts because its properties enable it to take an unbelievably bright mirror-like polish. Not only is Lustre-Die the proper basic analysis for working with plastics—we further enhance it by alloy fortification. It is heat-treated by oil-quenching and tempering to augment its properties, and comes ready for machining and polishing.

Lustre-Die is an electric-furnace steel, carefully inspected to insure cleanliness. It is free from injurious porosity or surface pitting. What's more, there's no problem about inclusion-causing additions.

Lustre-Die tool steel is worth looking into. For full details, check with your friendly Bethlehem tool steel distributor.

**BETHLEHEM TOOL STEEL  
ENGINEER SAYS:**  
*Follow These Hints When  
Drilling Small Diameter Holes*

Drilling small diameter (1/16 in. and less) holes when making tools is an operation which often causes considerable trouble. Breakage of drills in partly drilled holes occurs frequently, leading to the suspicion that the tool contains "hard spots." Investigation of such complaints by cutting up the suspected tool practically never confirms the presence of hard spots in modern high-quality tool steels.

Trouble in drilling small diameter holes is nearly always mechanical in nature, and is usually due to too low a drill speed, or too great a feed, or both. In order to obtain the normal speed (surface feet per minute) for cutting edges, it is necessary to run small diameter drills at high speeds in comparison to large drills. A 1/16-in.-diameter drill should turn at approximately 2000 rpm, for example, as compared to about 200 rpm for a 1/2-in. drill. Proper feeds for small drills are in the order of .001 in. to .002 in., as compared to about .008 in. to .012 in. for larger drills. Overfeeding and deep cuts produce longitudinal deflection or bending of the drill, which cause overloads resulting in drill breakage. Proper planning and maintenance of correct speeds and feeds will largely eliminate trouble encountered in drilling small diameter holes.



**LEHIGH H DIE BLANKS AXLE HOUSINGS**

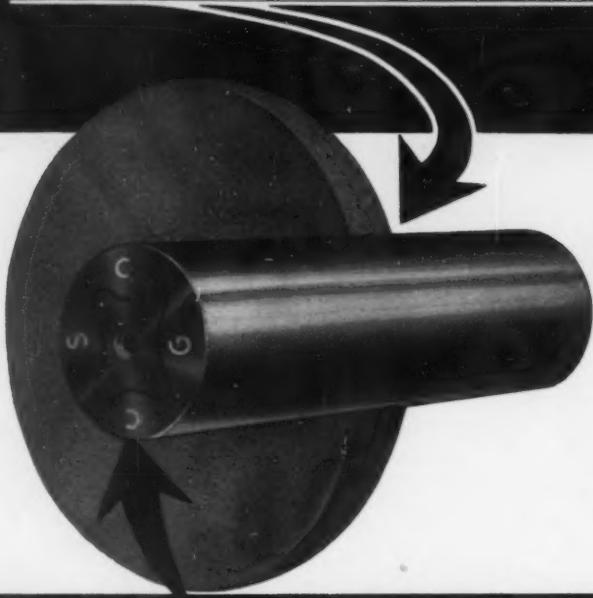
This Lehigh H die, hardened to Rockwell C61, blanked axle housings from 3/16-in. sheet steel, and produced 50,000 pieces before slight redressing was required. Lehigh H, our air-hardening high-carbon, high-chrome steel, was selected for this heavy-duty application because of its high wear-resistance, as well as for its minimum distortion in heat-treatment.

# An exclusive GRINDING PROCESS...

makes

## CUMBERLAND STEEL BARS

concentric, straight,  
smooth & *really* accurate



BE SURE OF THIS MARK ON THE END OF YOUR SHAFTS

## CUMBERLAND GROUND BARS FOR ALL TYPES OF MACHINES

They are carefully ground to our standard manufacturing tolerance, plus nothing to minus .002" on diameters 1-1/8" to 2-7/16" inclusive . . . plus nothing to minus .003" on diameters 2-1/2" to 8" inclusive. Closer tolerance can be furnished, if desired. And, remember, Cumberland Steel Bars are the end result of 109 years' experience,—and every bar is *carefully tested* before shipment. The list of Cumberland's customers reads like the "Blue Book" of Industry. Ask for further information.

### MANUFACTURED IN THREE SPECIFICATIONS

Cumberland Brand—AISI C-1020/C-1025, Elastic Limit 30,000# Min.

Potomac Brand—AISI C-1040, Elastic Limit 45,000# Min.

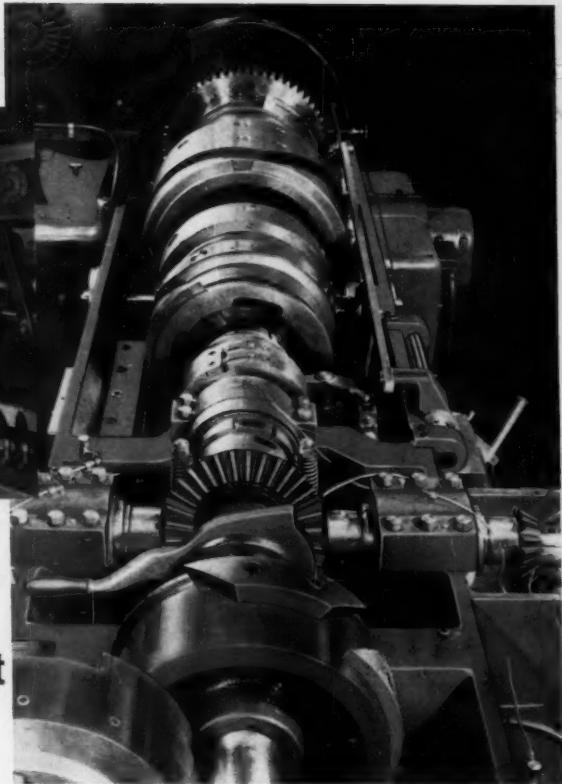
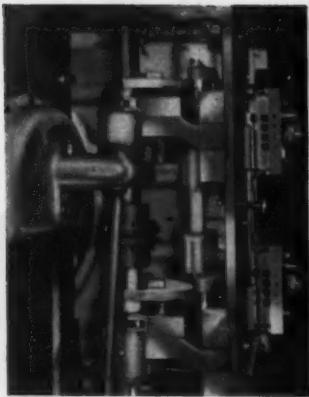
Cumsco Brand—AISI C-1141, Elastic Limit 57,000# Min.

## CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U.S.A.

ESTABLISHED 1845

INCORPORATED 1892

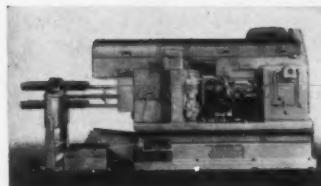


## Conomatic Provide Radial Screw Adjustment of Forming Tool Slides

- Models 2 $\frac{5}{8}$ " LA, 3 $\frac{1}{2}$ " AD, 5" KL, and 5 $\frac{1}{4}$ " KR Conomatic Four Spindle Bar Machines are equipped with a number of quick job-change features. One of these is the all-position end attachment drive for the mounting of endworking opposed spindles in all positions, with independent feed to as many as three opposed spindles on a single setup.

Another feature that is of considerable importance in tooling up is the radial screw adjustment of all sideworking slides. Trial cuts may be taken to correct diameters with form tools without changing the clamped positions of the form tool holders.

All Conomatic quick changeover models are equipped with dial adjustment of the working stroke of all tool carrying slides. Besides the Four Spindle machines there are three quick change Six Spindle models in  $\frac{9}{16}$ ", 1" and 1 $\frac{5}{8}$ " sizes.  
Write, wire, or phone for literature.



# Conomatic

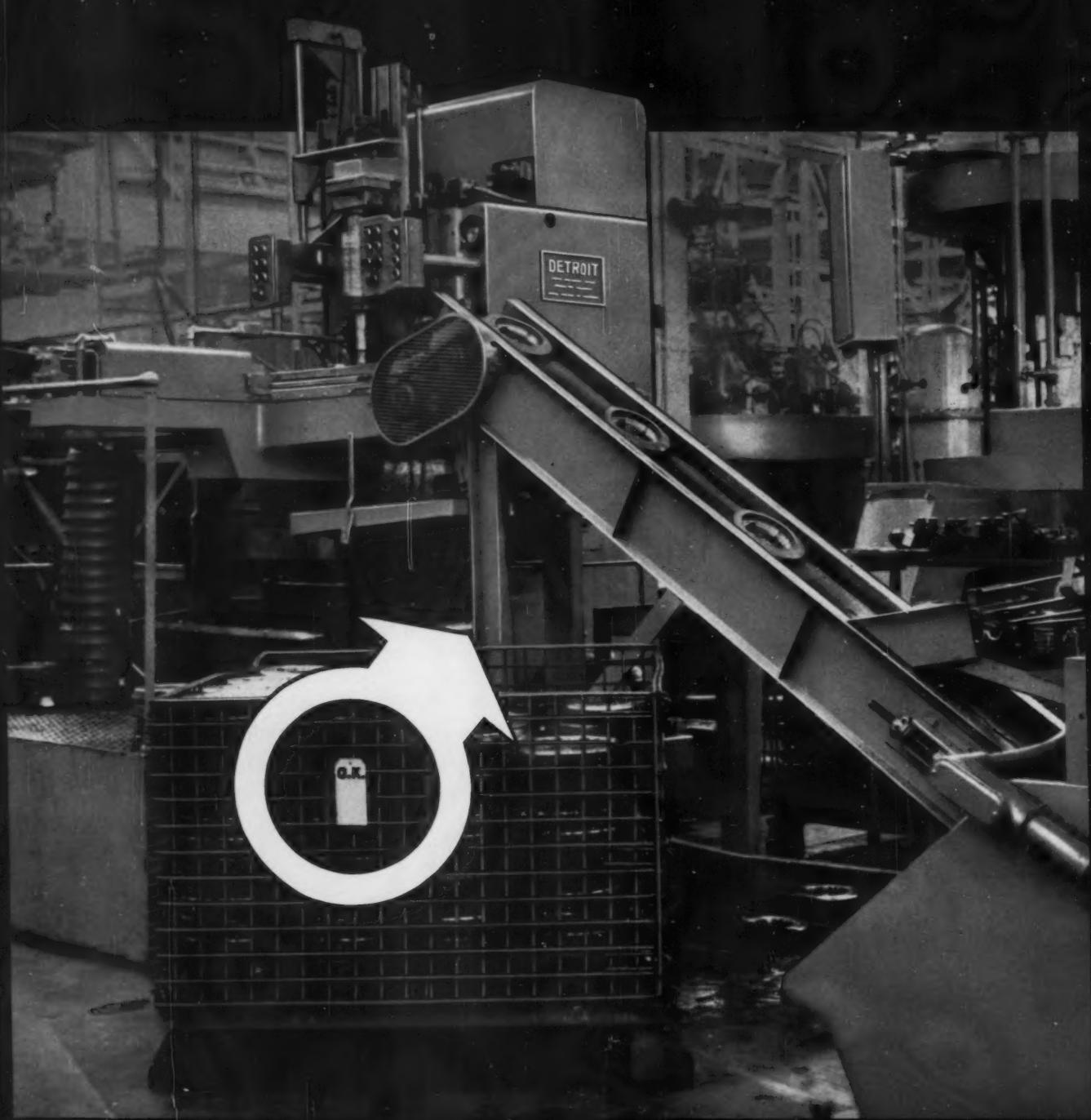
CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.



# DETROIT BROACH

*In the Production Picture with Industry's Leaders*

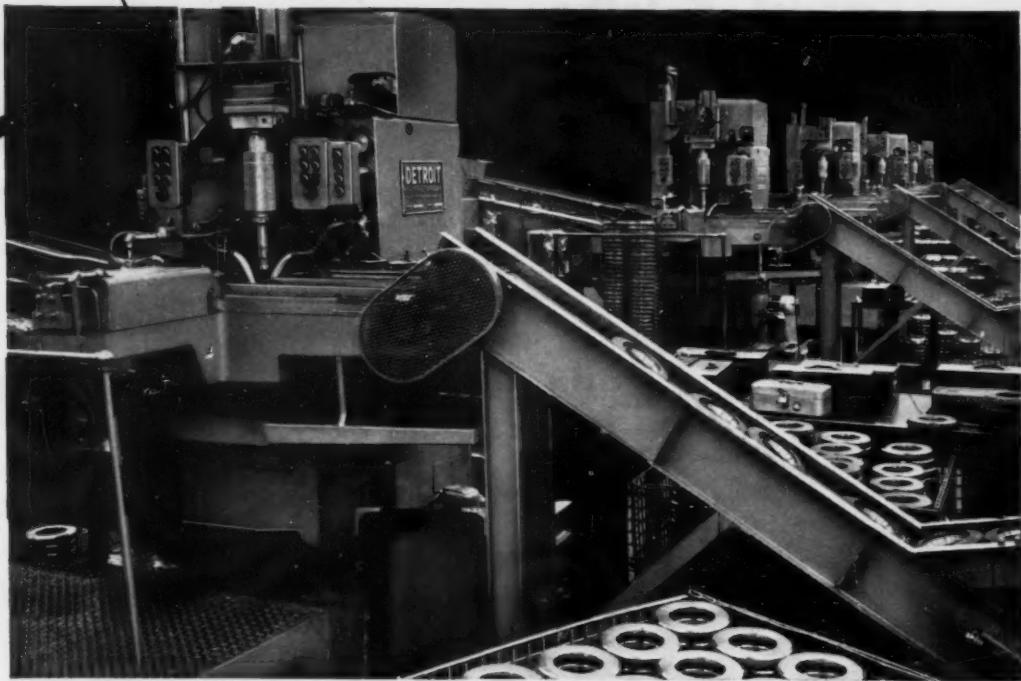
**LOCATION: Ford Chassis Parts Division  
Sterling Township, Michigan**





# 1440 GEARS PER HOUR

FROM THIS LINE OF  
**DETROIT BROACHING MACHINES**



The recently opened Ford manufacturing plant in Sterling Township, Michigan, is a 1,800,000 square foot model of production efficiency. Prominent in this production picture is a line of six Detroit Vertical Pull Down Broaching Machines, each machining tough ring gear forgings in completely automatic production cycles. Here are the job facts:

**PART:** Forged rear axle driven gear, SAE 8620.

**MACHINE:** Detroit Vertical Pull Down, 5-ton broaching capacity, 30" stroke.

**OPERATION:** Broach 4.987-4.988 I.D., starting in a 4.972-4.978 diameter hole following automatic chucking operation.

**MACHINE CYCLE:** (1) Part conveyed to load position, (2) Part hydraulically advanced to broaching position, (3) Pusher returns, signalling retriever down, (4) Broach picked up by puller and pulled down through part, (5) Part automatically ejected, (6) Ejector signals broach return to retriever, slide goes up, (7) Next part advanced to broaching position.

**STOCK REMOVED:** .0075" per side.

**HOURLY PRODUCTION:** 240 parts per machine at 100% efficiency.

This combination of standard Detroit broaching machines with relatively simple work handling devices results in a highly productive, fully automatic operation . . . plus the economy of standard production equipment, readily adaptable to future changes. Let Detroit Broach engineers suggest the right machine, the most efficient tooling and the correct degree of automation to solve your production machining problem. Send parts, prints or details for prompt recommendations.



This tool will broach 33,600 tough forgings before regrinding is necessary, according to tool life records carefully kept by Ford Motor Company.



Same plant, different department. One of two Detroit 15-ton, 66-inch stroke Vertical Twin Ram machines on bearing cap forgings.

**DETROIT BROACH & MACHINE COMPANY**

DEPARTMENT B-9 • ROCHESTER, MICHIGAN

**lodge & shipley  
model X lathe  
paid for itself  
in just 18 months!**

Time savings on a single workpiece, an evaporator drum 24" in diameter and 35" long, have paid for a Model X Lathe in just 18 months. The user, York Corporation, Division of Borg-Warner, records per piece savings at \$25.92, saving 172.8 minutes against a previous time of 465.5 minutes per piece. Annual savings figure to \$12,400!

Conservatively priced yet ruggedly durable, Lodge & Shipley Model X Lathes are an outstanding value with speed, power and accuracy equal to lathes costing far more.

If you would like a complete case history report on the Model X performance outlined above, write today: **The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.**

**Lodge & Shipley**  
... your Lodge-ical choice

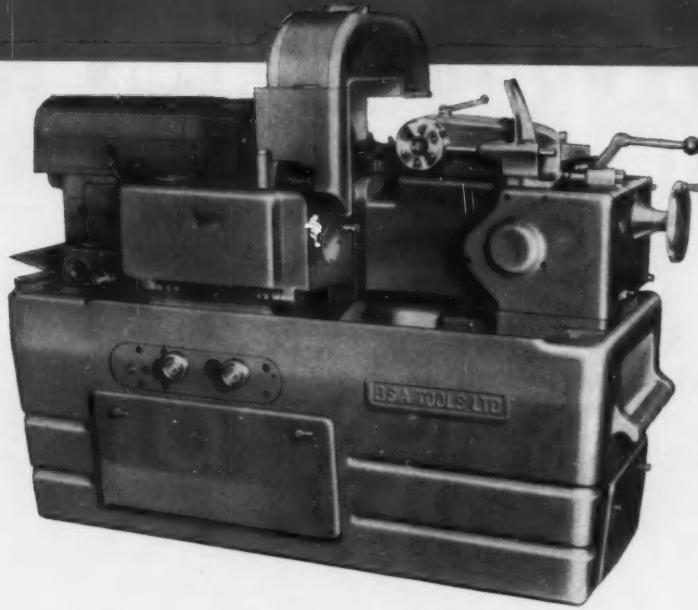
"Cool" savings at York Corporation,  
turning evaporator drum for ice-making machine;  
time savings alone, "better than 37%!"

**PAID**

# BSA

# first to provide UNIT REPLACEMENT of parts subjected to most wear

to keep important production flowing with new machine performance



**Additional Production Advantages of BSA**  
FIVE STANDARD CAPACITIES:  $\frac{1}{2}$ ",  $\frac{3}{4}$ ", 1",  $1\frac{1}{2}$ ", and 2".  
WIDE RANGE OF SPINDLE SPEEDS—  
200 to 6000 on  $\frac{1}{2}$ " machine, 69 to 1260  
on 2" model.  
Cams, change gears and tooling easily  
accessible FOR QUICK JOB-TO-JOB  
CHANGEOVER.

**Advantages of BSA**  
Unit construction provides quick access  
for EASY MAINTENANCE.  
Special spindle mounting, DESIGNED  
TO REDUCE WEAR.  
Positive chain drive from gear box to  
spindle PREVENTS SLIPPAGE.  
All models use STANDARD AMERICAN  
TOOLING

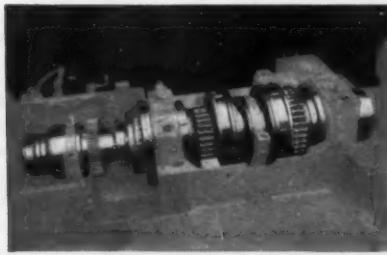
With speeds, machining accuracy, ease of tooling and operation and maintenance equal or superior to any machine in its classification, BSA Single Spindle Automatic Screw Machines offer a very definite plus value through "unit construction and replacement" of work spindles, side slides, turrets and gear boxes.

Unit construction, plus extremely rigid, one-piece machine frame makes it possible to bring BSA machines back to factory standards of perfection quickly. You place an important unit back in the line with a minimum of lost production.

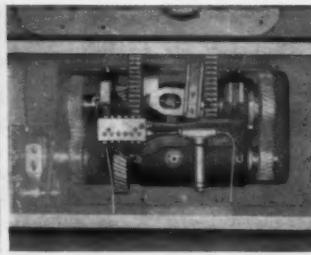
Shipment of replacement parts are speeded to you from National Acme, in Cleveland. Here, also, full engineering and design services as well as demonstration and service facilities, in the National Acme tradition, are available to you.

May we explain how "unit construction and replacement" can ease your production problems?

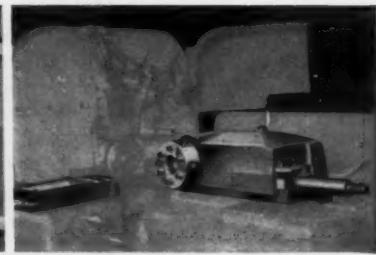
#### UNIT CONSTRUCTION SPEEDS REMOVAL OR REPLACEMENT



Work Spindle



Gear Box



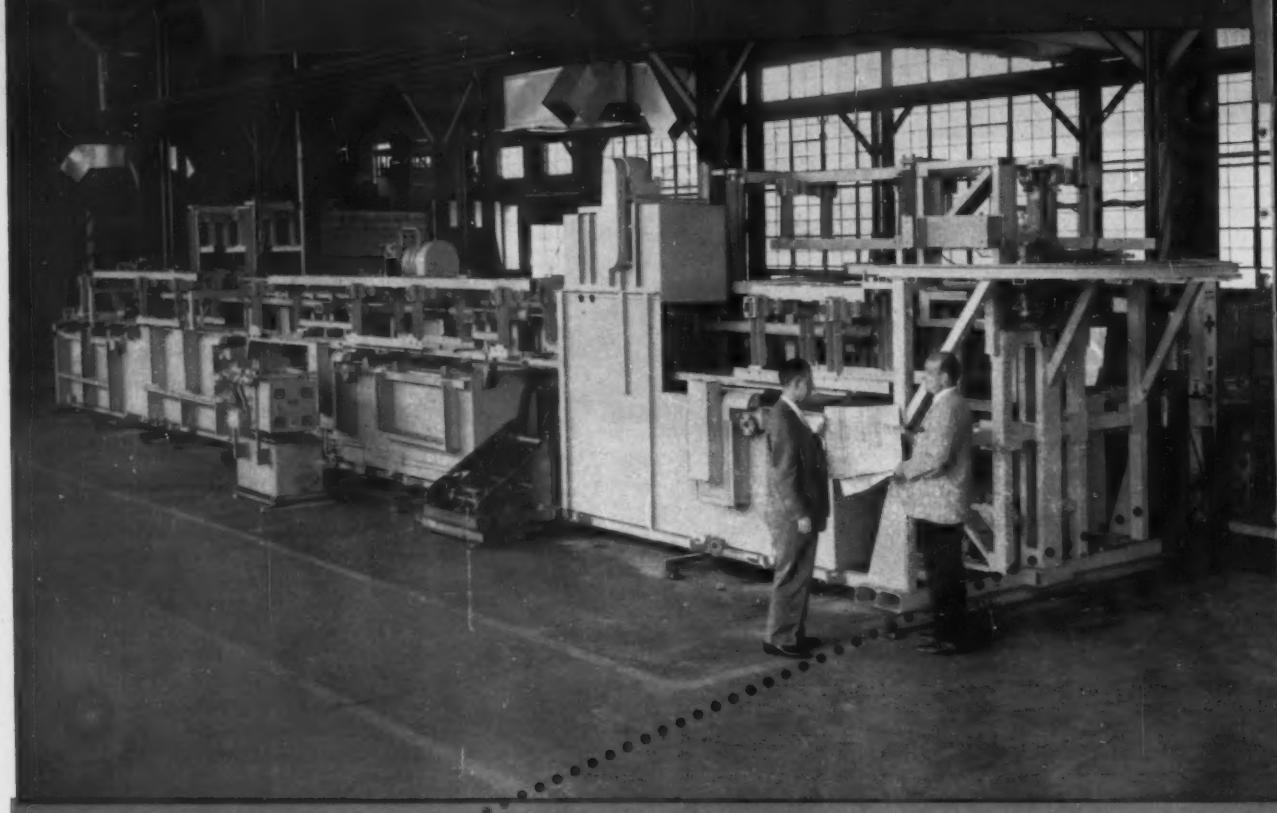
Side Slides and Turret

Distributed and Serviced in U.S.A. by...

# National Acme

THE NATIONAL ACME COMPANY, 179 E. 131ST ST., CLEVELAND 8, OHIO • Sales Offices: Newark 2, N.J., Chicago 6, Ill., Detroit 27, Mich.

# Silence is



This new Wagner Automatic meets headroom restriction admirably. Height over all 9'10", clearance 1 1/8".

Yes, the silent operation of this Wagner Automatic Plating Machine means money in your pocket, for silence in any fine piece of machinery indicates a complete absence of vibration or impact. The quiet, smooth operation of the new Wagner Automatic prevents jarring of plating racks and loss of parts, reduces wear, repairs and costly downtime.

Here's how Wagner gives you advantages not offered by any other automatic plating equipment:

**1. EFFICIENCY** — Every Wagner Automatic is a custom machine designed for a specific cycle but

uses standard components and assemblies. They are not standard machines resulting from a series of compromises.

**2. CAPACITY** — The Wagner Automatic provides greater load capacity per dollar invested. Deeper tanks are practical with low headroom, hence greater capacity per square foot of plant area. Our automatic loader may be installed to integrate the machine with conveyors to and from other processes, reducing handling to a minimum.

**3. ECONOMY** — Standard components are used

MANUFACTURERS AND PROCESSORS OF ALL METAL-FINISHING

Chicago

Indianapolis

Cincinnati

Rochester

400 MIDLAND AVE.,

# Truly Golden!

## IN THE WAGNER AUTOMATIC

throughout, so parts are easily available. Wagner modular assemblies contribute to fast, low cost installation and replacements. Adjustments are easily made by untrained personnel with simple tools.

**4. SAFETY** — Wagner "Automatics" have "built-in intelligence" which prevents damage. Completely automatic stops throw the power switches the instant a jam or trouble develops. No crack-ups, no destroyed parts, no loss of metal.

**5. SMOOTHNESS** — Hydromotors actuate both vertical and horizontal transfer. Vertical work lift arms are raised by rack and pinion mechanisms, guided by hardened rollers. The horizontal transfer carriage rolls effortlessly on stainless steel balls. All mechanisms are easily reached for lubrication or central lubrication may be installed. There are no dogs, cams or conveyor hooks to create jarring impact.

**6. CLEANLINESS** — There are no moving parts or hydraulic connections above tanks, consequently

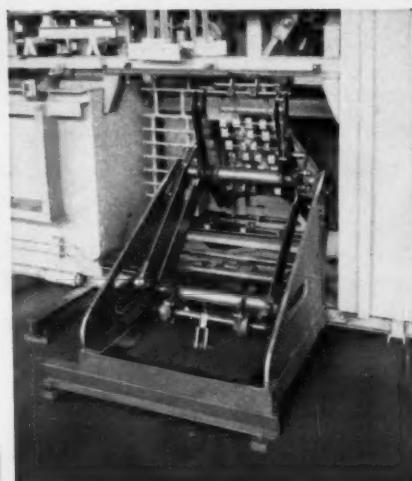
you don't have to battle contamination of solutions by dripping fluids and lubricants. Corrosion and gumming of mechanisms is eliminated as moving parts are not directly above source of fumes.

**7. ENGINEERING** — Wagner engineers analyze your problem, design your complete finishing system and take full charge of installation of Wagner automatics, rectifiers or other equipment required. Expert service after installation is immediately available when requested.

If you have a plating problem, whether it is an automatic or still tank operation, consult the Wagner man in your area. Remember, only Wagner manufactures the equipment and processes the chemicals required by your plating plant. You can get all the answers from one source, and service beyond compare. Call, write or wire.

### WAGNER MATERIALS HANDLING ENGINEERING SERVICE . . .

In addition to engineering and installation of complete plating systems, we assume responsibility for design and construction of equipment for handling parts plated or to be plated, integrating with your automated processes. The Wagner "Flipper" shown was engineered for the job but is adaptable to other parts handling problems. It removes loaded racks after plating and deposits entire load on belt conveyor. Most Wagner machines also include our automatic loader which transfers loaded racks from chain conveyor to plating machine.



### CHEMICALS, ANODES, AND EQUIPMENT

Cleveland

Grand Rapids

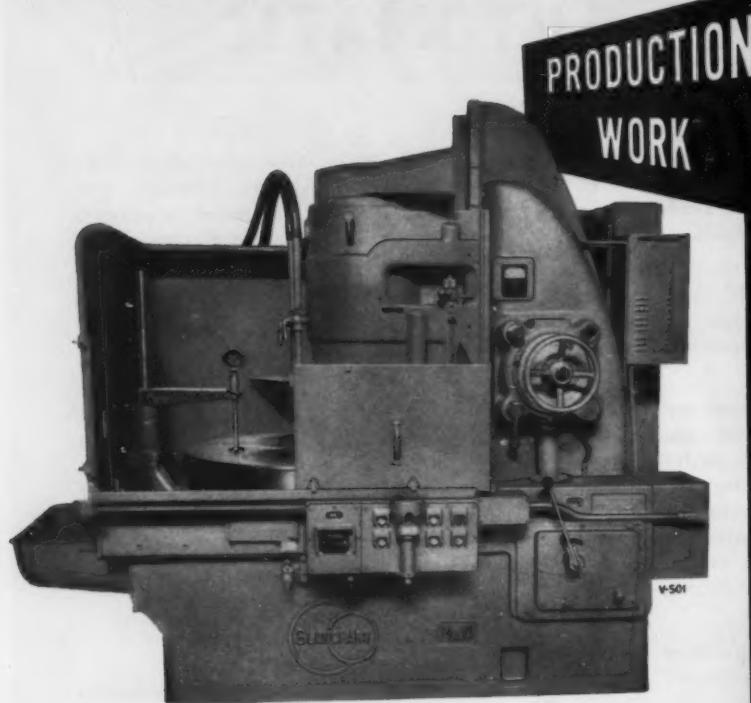
DETROIT 3, MICHIGAN

For more information fill in page number on Inquiry Card, on page 255

**Wagner**  
BROTHERS INC.

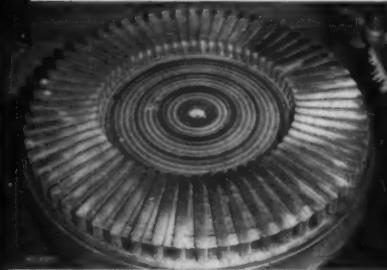
MACHINERY, September, 1957—123

# for BEST results in surface grinding... **PUT IT ON THE BLANCHARD**

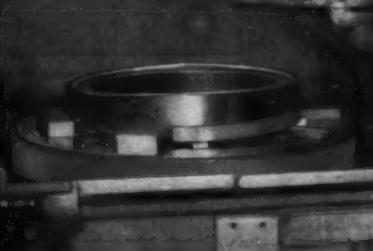


PRODUCTION  
WORK

SIDE PLATES. 9" x 18" plates ground from rough on No. 18 Blanchard with 36" chuck. Stock removal 1/16" to 1/8" per side. Held flat within .003", parallel to .001", and to dimension tolerance of ± .001". Production: 30 surfaces per hour.



CONNECTING LEVERS. Cast iron levers ground in special magnetic fixture with pins located in "vee's". Stock removal per side is 1/32" to 1/16"; must be flat and at right angles to pins. No. 18 production: 180 pieces per hour, compared to 20 pieces per hour by former method used.



HARDENED STEEL PUNCHES. This 24-13/16" dia. punch, reground on a No. 18, is centered radially on 36" magnetic chuck. Duplicate circumferential and radial shear reliefs are generated with two setups.



GRANITE SURFACE PLATES. A No. 18 Blanchard reconditions this 18" x 34" granite surface plate by grinding it flat within .0002". 3/16" of stock is removed in 5 hours.

Blanchard Grinders are used throughout industry on surface grinding jobs that demand the utmost in production, finish and accuracy.

Whatever you're surface grinding, there's a Blanchard designed to do the job speedily and accurately.

**PUT IT ON THE BLANCHARD**

Send for free copies of "Work done on the Blanchard", fifth edition, and "The Art of Blanchard Surface Grinding".

**THE BLANCHARD MACHINE COMPANY**  
64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

## SMOOTH... SMOOTH...

Well, smooth as 50 million inches. That's smooth enough for what?

So, just this: there is a definite correlation between smooth surfaces and wearability, between smooth surfaces and cutting tool performance, between smooth surfaces and quality in any manufactured product.

That's why Greenfield's research engineers consider no task complete until the subject has been "smoothed" beyond belief.

You get the benefit of their findings in the GREENFIELD tap and dies you buy.

TODAY'S TRENDS ARE TOMORROW'S PAYOFF.

**GREENFIELD**

TAP AND DIE CORPORATION, GREENFIELD, MASS.



**BUY FROM YOUR GREENFIELD DISTRIBUTOR FOR SERVICE AND QUALITY**



Photo courtesy The Monarch Machine Tool Company

**THE LATHE** — *Monarch Series EE Model 1000 Precision Lathe*

**THE OPERATION** — *The turning of a stub shaft*

**THE CHUCK** — *Horton, of course*

**HORTON CHUCK DIVISION**  
Greenfield Tap and Die Corporation  
Windsor Locks, Connecticut



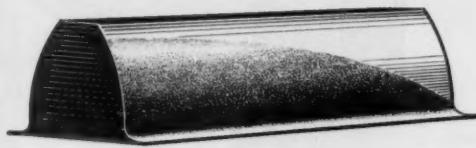
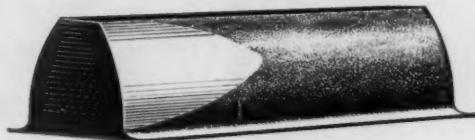
*Call Your Horton Distributor Now!*

# Hard Gear Honing

GIVES YOU BETTER  
GEARS  
AT LESS COST

## QUICK GEAR INSPECTION

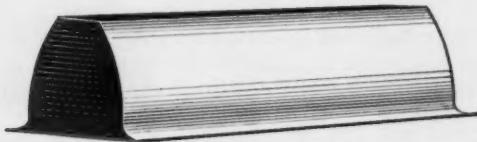
One quick pass with a Red Ring honing tool cleans up the teeth or immediately reveals heat-treat distortions, thus indicating corrective adjustments in the gear forming processes.



SPUR AND HELICAL GEAR SPECIALISTS  
ORIGINATORS OF ROTARY SHAVING  
AND ELLIPTOID TOOTH FORM

## CORRECTION OF HEAT-TREAT DISTORTIONS

Minor distortions in tooth profile, helix, index and runout are corrected in from 15 to 60 seconds of honing time.



## IN ADDITION

Gear honing provides:

- The Lowest Cost Remedy for Nicks and "Hickies"
- Improved Tooth Surface Smoothness
- Overall Sound Improvement

For Quality Gear Production, write for Bulletin H57-2 which gives the full story on Red Ring Hard Gear Honing.

**NATIONAL BROACH & MACHINE CO.**

5600 ST. JEAN • DETROIT 13, MICHIGAN

7875

WORLD'S LARGEST PRODUCER OF GEAR SHAVING MACHINERY

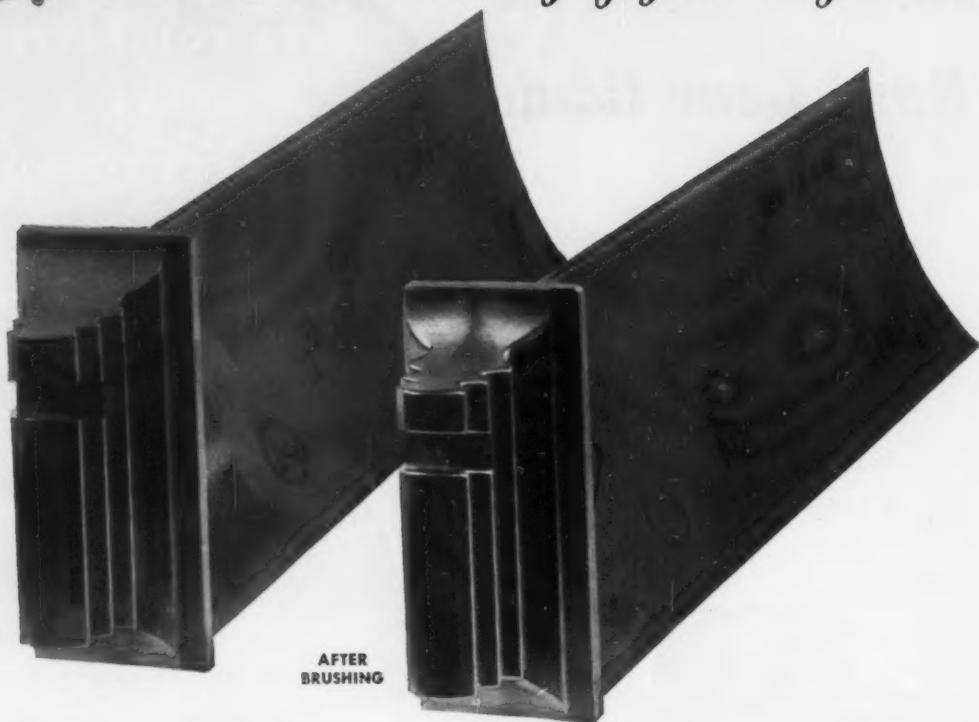
For more information fill in page number on Inquiry Card, on page 255

MACHINERY, September, 1957—125



BRUSHING METHODS worthy of your confidence

BEFORE  
BRUSHING



AFTER  
BRUSHING

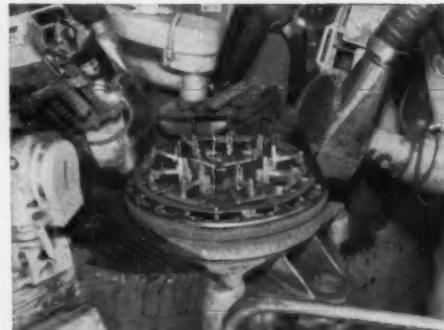
## Root of a Production Problem

*... solved with Osborn Power Brushing*

YOU'RE looking at the root end of a turbine blade for jets . . . one of hundreds that go into every engine. Size and surface finish of the root must be held to exacting precision for perfect assembly and highest ultimate strength. Yet production costs must be down to earth.

Utilizing Osborn's power brushing method, jet blades are held in a fixture and traversed past Osborn Fascut® Brushes. In one simple operation, all minute burrs on the root end are removed, surface junctures are blended eliminating sharp corners where stress concentrations might occur. Results are uniform, dependable . . . at a high rate of production. The operator has only to load and remove parts.

An Osborn Brushing Analysis will show you how Osborn Power Brushing can simplify your metal-finishing operations. Write *The Osborn Manufacturing Company, Dept. D-38, Cleveland 14, Ohio.*



*Osborn Brushamatic® 51-3L with three brushing heads finishing root ends of jet blades.*

Send TODAY  
for the new  
20-page  
Brushamatic Booklet

Osborn Brushes 

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES • BRUSHING MACHINES • FOUNDRY PRODUCTION MACHINERY



**"This used to take hours...**

now the whole gearcase comes off in minutes!" Quite an accomplishment for an enclosed eccentric press. Too often the advantages of the enclosed design are gained by sacrificing the accessibility of the open design. Not so with Bliss; however: Bliss engineers count practical maintenance a design "must"—any new design that comes off the boards at Bliss keeps the maintenance man in mind.

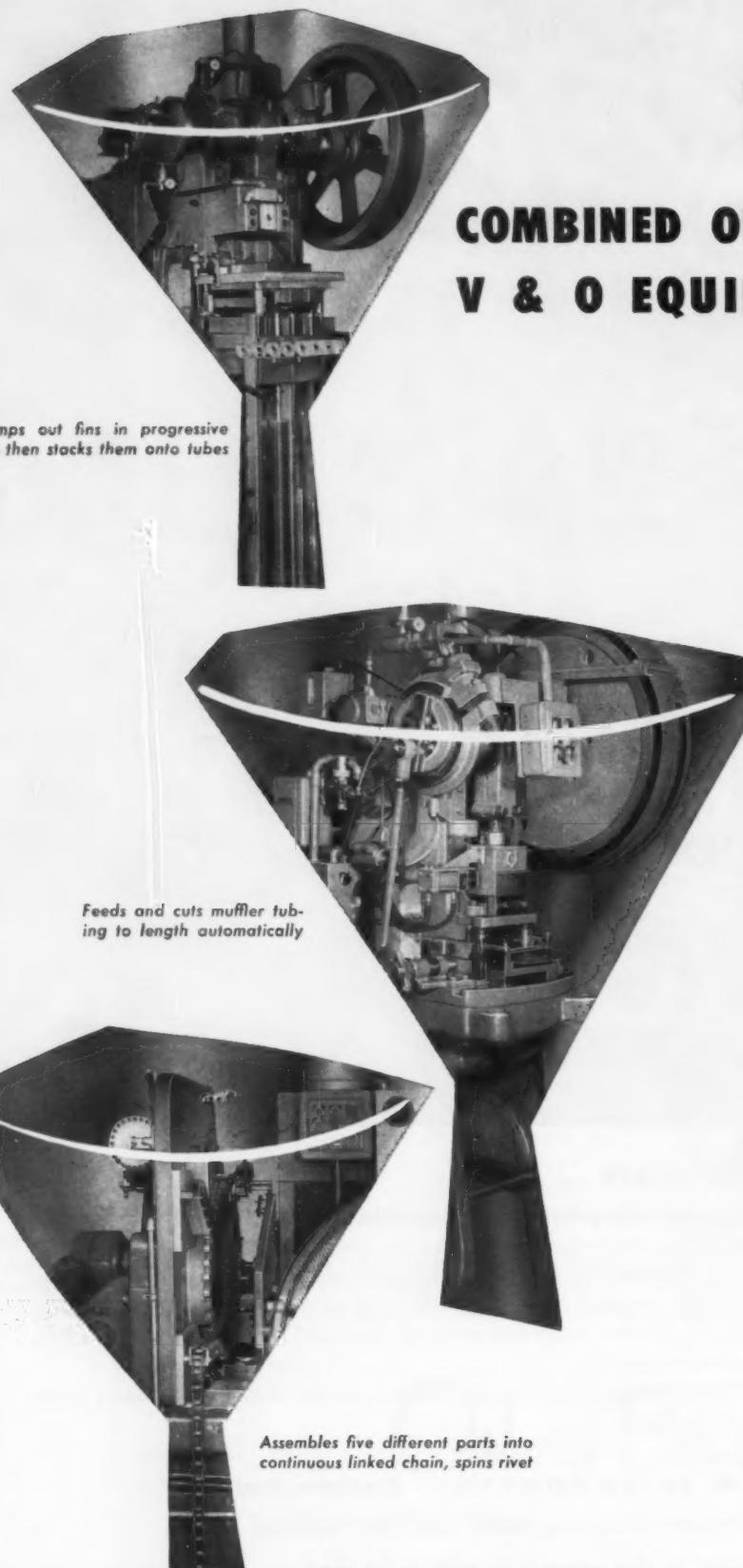
Which is one more reason why industry agrees, "Bliss is more than a name...it's a guarantee."

**BLISS**  
SINCE 1857

**E. W. BLISS COMPANY • Canton, Ohio**

*100 years of making metal work for mankind*

PRESSES • ROLLING MILLS • MILL ROLLS • DIE SETS • CAN MACHINERY • ORDNANCE



**FUNNEL TO SAVINGS IN  
HANDLING AND MOTION**

## **COMBINED OPERATIONS ON V & O EQUIPPED PRESSES**

*Stamps out fins in progressive die, then stacks them onto tubes*

Each of the above units (designed and built by V & O) "funnels" two or more operations into an integrated system of parts production. Eliminated are such intermediate tasks as materials-handling between machines, hand-placing of partly finished pieces in dies, and separate inspections of parts in process.

*Feeds and cuts muffler tubing to length automatically*

All three units are based on standard types of V & O presses. Even the chainmaking press, which is on its back to facilitate tool operation, follows a precedent well-established by V & O. Of equal importance is the fact that V & O presses are especially designed for combined operations. Featuring long slide precision, they have the accuracy, sturdiness and adaptability essential to long die life and smoothly functioning feeds and attachments.

*Assembles five different parts into continuous linked chain, spins rivet*

Remember, too, that we probably have more experience in equipping presses for automatic methods than anyone else. We have been doing it since 1889. Why not put this experience to work now—it can mean important cost reductions in your production operations.



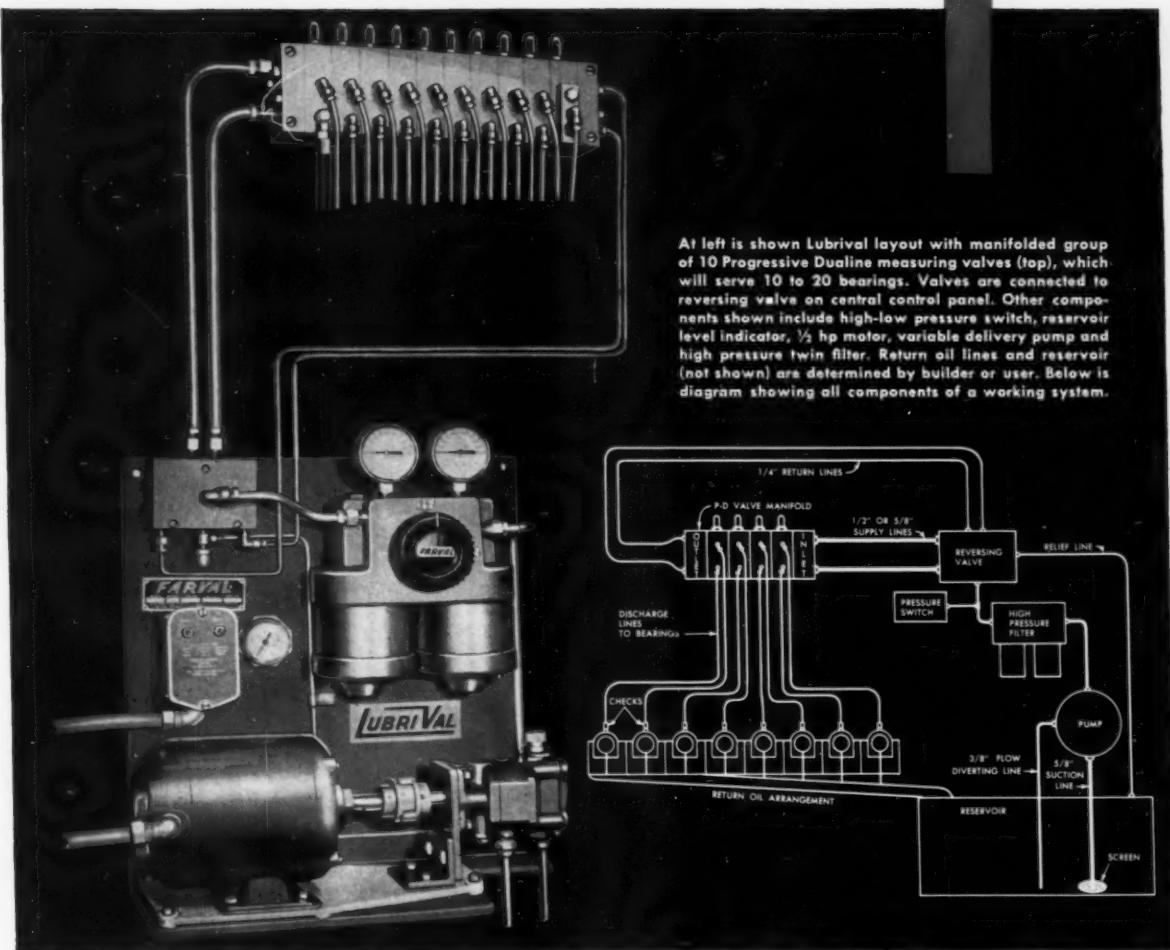
**THE V&O PRESS COMPANY**

Division of Emhart Mfg. Co.  
341 UNION TURNPIKE, HUDSON, NEW YORK

PRESSES AND METHODS THAT AUTOMATICALLY REDUCE COSTS

# LUBRIVAL — a revolutionary new system to supply and circulate lubricating oil

FARVAL—  
Studies in  
Centralized  
Lubrication  
No. 204



At left is shown Lubrival layout with manifolded group of 10 Progressive Dualine measuring valves (top), which will serve 10 to 20 bearings. Valves are connected to reversing valve on central control panel. Other components shown include high-low pressure switch, reservoir level indicator, 1/2 hp motor, variable delivery pump and high pressure twin filter. Return oil lines and reservoir (not shown) are determined by builder or user. Below is diagram showing all components of a working system.

• Lubrival is designed for low volume, high pressure circulating lubrication of presses, automatic and semi-automatic machine tools and other industrial equipment designed for circulating oil systems. Lubrival is a Farval system, employing the Dualine principle of delivering oil to measuring valves which pass it under pressure to bearings. Lubricant is force-fed by positive piston displacement. Flow can be regulated over a range of 10 ounces to 1 gallon per minute.

Lubrival Progressive Dualine Valves, manifolded in any number required, have individual sight indicators. A pressure sensing mechanism warns of clogged or broken lines in any part of the system—a feature entirely new to circulating oil systems.

For dependable protection of bearings and economical operation of machines, look into Lubrival. If you are a builder, offer Lubrival protection to your customers. If you use presses and machine tools, specify Lubrival on your next equipment order. The Farval representative near you will give you all details. Or write for Bulletin 70. The Farval Corporation, 3276 East 80th Street, Cleveland 4, Ohio.

*Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing.  
In Canada: Peacock Brothers Limited.*

**KEYS TO ADEQUATE LUBRICATION—**  
Wherever you see the familiar Dualine valve manifolds, dual lubricant lines and central pumping station, you know a machine is being properly lubricated. Farval manually operated and automatic systems protect millions of industrial bearings.



## **When you discover "suddenly**

### **for production men**

This Avey machine is used in a jet aircraft plant on the West Coast for drilling, boring, and spotfacing the flanges and periphery of a jet engine component.

The two Aveydraulic units mounted horizontally have 12" ram travel. The third Aveydraulic unit, mounted vertically, has 16" ram travel and a 6-speed gear box with a speed range of 150 to 1800 rpm. The vertical column has an in and out traverse of 20"; moves to a minimum of 15" and a maximum bolt circle of 55".

The 60" Electrodex table is equipped with a master index ring with two rows of bushings, 96, 49, and 8 indexes respectively. The three heads can be programmed to the indexing of the table.

Another example of how Avey combines standard units to meet special production requirements.

### for management

A single buying decision by a competitor can turn your machines into horse-and-buggy relics, and hang a celluloid collar around your unit costs. Suddenly it's 1906 in your plant. Drastic as this may sound, it is quite possible in this day of modern production equipment which can multiply productivity per man-hour and slice pennies off the cost per piece.

Successful managements realize this, and don't wait for competition to take the initiative. Many of them know that it costs them less to purchase an Avey production machine than it does to keep their old equipment.

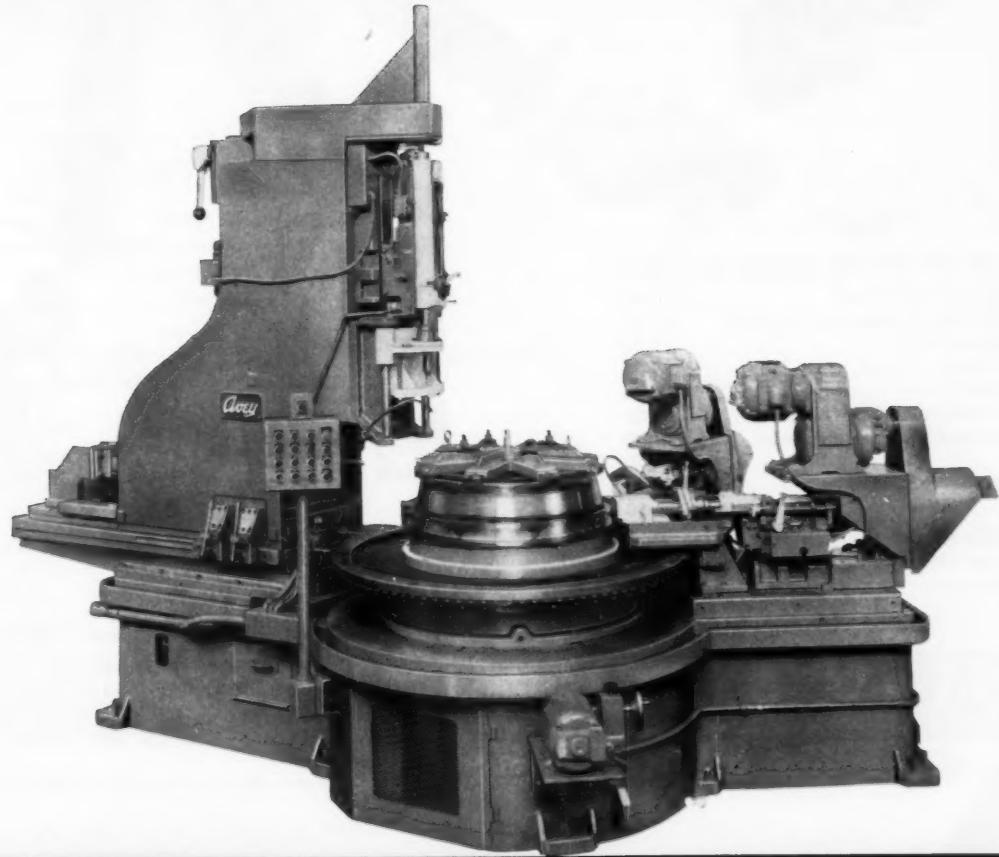
One good reason is that Avey's modular construction permits re-use of units for several different jobs. There are many others which we'll be pleased to tell you about. Avey Division, The Motch & Merryweather Machinery Co., Box 625, Cincinnati 1, Ohio.

**drilling, tapping, production machines**

**it's 1906"**



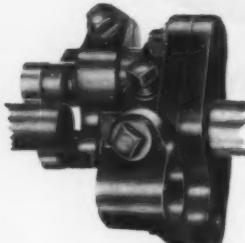
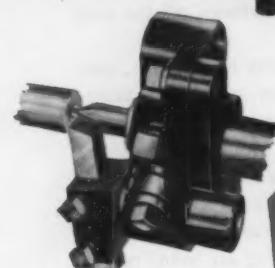
THE MOTCH & MERRYWEATHER MACHINERY CO.



# R and L

## TURNING TOOL

REPLACES AN ASSORTMENT  
OF 14 TOOLS!



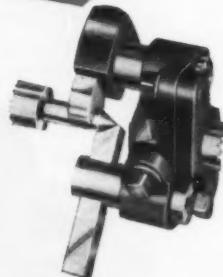
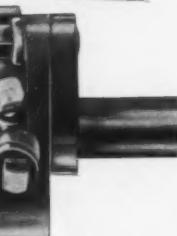
The R and L Turning Tool can be  
changed from right to left in  
10 seconds, and vice versa.

... It is guaranteed not  
to bend or give way  
in any manner.



R and L Turning Tool  
used as ROLLER BOX TOOL

R and L Turning Tool  
used as POINTING TOOL



### YOU SAVE ON YOUR ORIGINAL INVESTMENT

|                           |          |
|---------------------------|----------|
| Roller Box Tool           | \$77.00  |
| Centering and Facing Tool | 22.00    |
| Knee Tool                 | 37.00    |
| Pointing Tool             | 36.00    |
| Back Rest                 | 29.00    |
| Floating Drill Holder     | 14.00    |
| Balancing Turning Tool    | 52.00    |
|                           | \$267.00 |
| Same for left hand        | \$267.00 |
|                           | \$534.00 |

One R and L TURNING TOOL of a similar  
size (No. 1) costing only \$96.50 will take  
the place of the above assortment of tools!

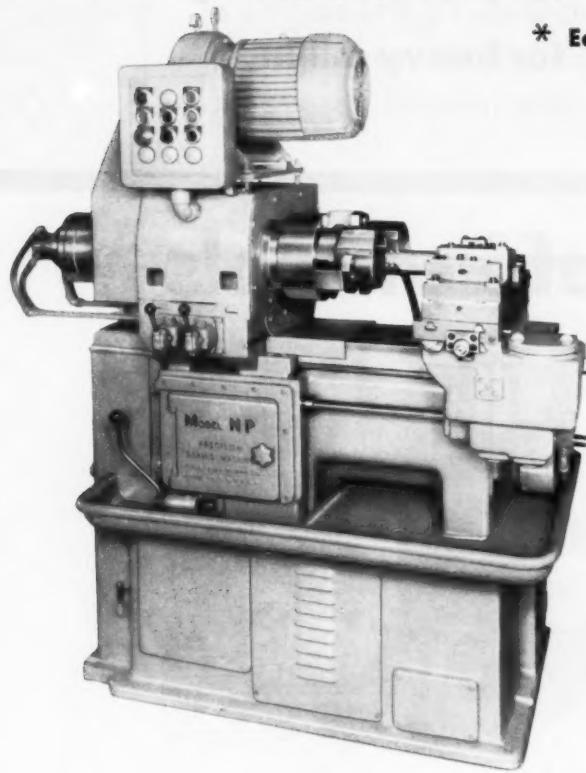
Write for complete catalog of R and L Tools

### OTHER FAMOUS R and L TOOLS:

TURNING TOOL • CARBIDE OR ROLLER BACKRESTS • RELEASING OR NON-  
RELEASING TAP AND DIE HOLDERS, (ALSO FURNISHED FOR ACORN DIES)  
UNIVERSAL TOOL POST • CUT-OFF BLADE HOLDER • RECESSING TOOL  
REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL

**R and L TOOLS**  
1825 BRISTOL STREET • PHILADELPHIA 40, PA.

# NEW MACHINE OF THE MONTH NEW ECONOMY\* IN PRECISION BORING



\* Economy in initial investment

Economy in machining costs

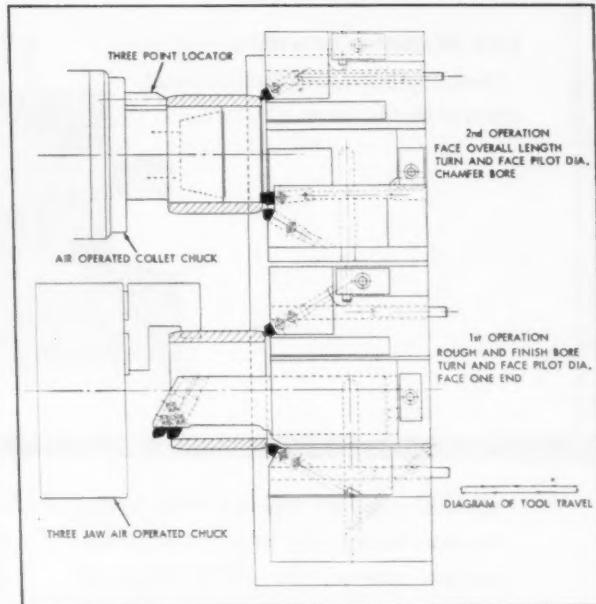
Economy in maintenance costs

Economy in change-over time

The new Seneca Falls Model "NP" Precision Boring Machine is a top quality, reasonably priced, mechanically operated machine available with either one or two precision spindles mounted independently on a fixed bridge. Either the work or the tools can be rotated on the spindles. The patented "Quick Change-over Mechanism" permits variations in carriage stroke, rapid traverse and feed cycle without changing or purchasing additional cams and reduces average changeover time to less than thirty minutes. The design of the headstock bridge permits the installation of other makes of standardized boring heads.

Let our engineering staff help solve your precision machining problems.

The two-spindle machine illustrated above is equipped for boring, facing and rabbeting both ends of field rings in a single machine cycle. When the operator removes a finished piece from the rear chuck, he transfers a semi-finished piece from the front chuck and replaces it with a rough piece. When the starting button is pressed, the tools move forward in rapid traverse to cutting position, automatically shift to cutting feed, and finally return to starting position in rapid traverse. The entire operation is automatic. The field rings are 4-1/2" in diameter and a production of 60 pieces per hour at 100% efficiency is easily maintained. Tooling arrangement is illustrated opposite.



SENECA FALLS MACHINE CO.

SENECA FALLS, NEW YORK

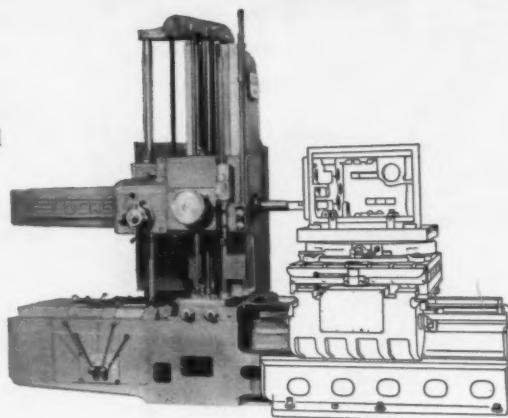
## Select a Lucas

for accurate spacing  
for precision boring  
for heavy milling

# Your choice of controls—

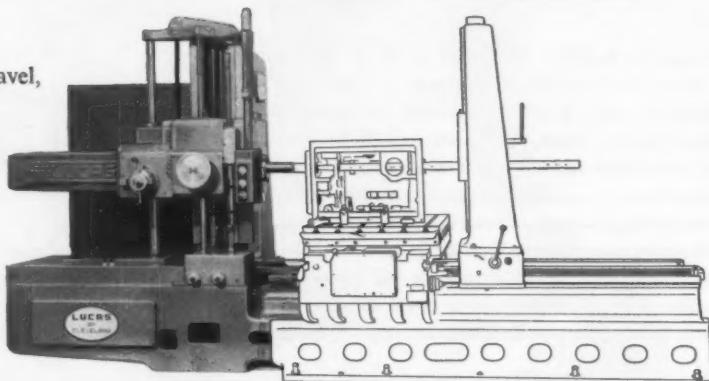
### **STANDARD LEVER CONTROLS**

available for use with both short bed or backrest models.



### **FULL PENDANT CONTROL**

of feeds, speeds and directional travel, optional on any Lucas.

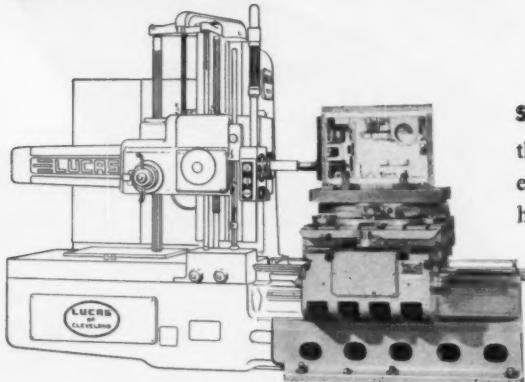


Whether you do line or stub boring, whether you prefer lever or automatic pendant control, you get the basic advantages of automatic power positioning and 4-way beds. Whichever model you

select you get the benefit of continuing design improvement, backed by 57 years of specialization and leadership in this field *plus* the full resources of The New Britain Machine Company.

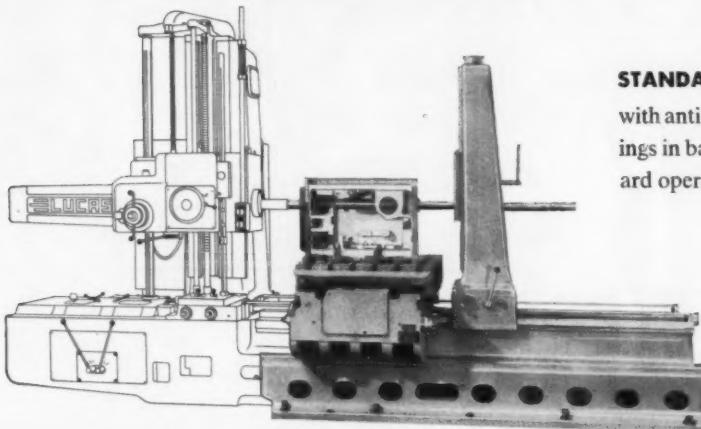
in production  
 in the tool room  
 in experimental work  
 in engineering research  
 in maintenance applications  
 or several, in combination

## your choice of beds



### SHORT BED MODELS

the most compact and economical equipment for precision stub boring, heavy milling and horizontal drilling.



### STANDARD BED WITH BACKREST

with anti-friction bearing mounted bushings in backrest block, handles all standard operations including line boring.



### LUCAS MACHINE DIVISION

The New Britain Machine Company  
Cleveland, Ohio

OTHER NEW BRITAIN MACHINE TOOLS DIVISIONS

New Britain-Gridley Machine Division  
New Britain, Connecticut

Hoern & Dilts Division  
Saginaw, Michigan

## **The ONLY Turret Lathe with a fully automatic thread-chasing cycle!**

Here is full turret lathe versatility and a threading attachment with a fully automatic cycle — all in one machine. Now you can be sure of concentricity of threading with other lathe work, *all done in one chucking*, with the time saving of the Auto-Threader! Nowhere else in the world can this be found on a turret lathe.

This Auto-Threader will chase straight

or taper threads — or a combination — internal or external, from the front of the machine.

Concerning this J&L development, a customer writes: "We are tripling production on many of our items."

Write for descriptive folder No. 5440.  
**JONES & LAMSON MACHINE COMPANY,**  
512 Clinton Street, Springfield, Vermont.

### **JONES & LAMSON TURRET LATHES**

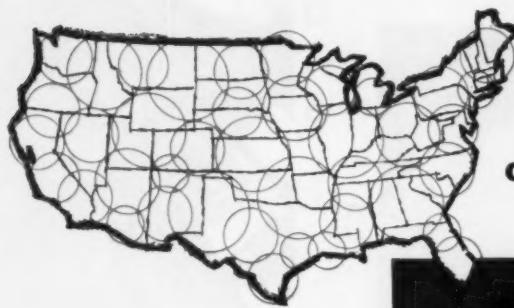
Turret Lathes • Fay Automatic Lathes • Milling & Centering Machines • Optical Comparators • Thread Tools

the man who needs a  
new machine tool is  
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Thread & Form Grinders



# Precision + Interchangeability

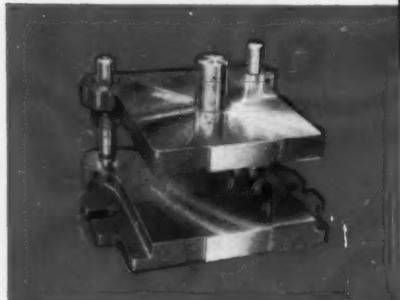
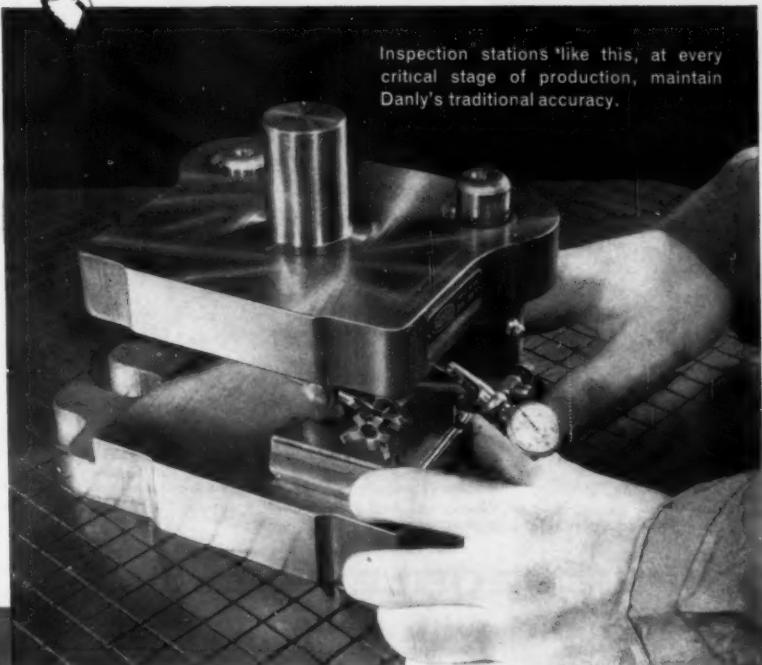


= Availability

ON **NEW** DANLY DIE SETS

Danly leadership in die set distribution is made possible by the precision with which Danly sets are made. Precision makes Danly die set components completely interchangeable . . . parts can be stocked by branch assembly plants or distributors throughout the country and assembled for delivery in any of thousands of combinations as standard die sets to meet specific tooling needs. No matter where you are, from New England to California, you get the same Danly precision, the same broad selection, the same fast service.

Inspection stations like this, at every critical stage of production, maintain Danly's traditional accuracy.



Leading industrial distributors and Danly branch assembly plants—located in all major tooling centers—stock Danly Die Sets for fast delivery.

**DANLY MACHINE  
SPECIALTIES, INC.**



DEPT. E

2100 South Laramie Avenue  
Chicago 50, Illinois



At American Can, Chicago, Scott Wipers\* are used for cleaning shop machines, tools and parts in process. 2-ply paper Scott Wipers are Perf-embossed,® a special process which speeds absorption, gives more thorough cleaning action.

\*PATENT PENDING

## WIPER PROBLEM? Look what Canco did with Scott Wipers!

American Can Company's Chicago plant makes cans for foods, paints, oils, waxes, insecticides and many other products. Scott Wipers were put on a 2-month trial basis in October, 1954 . . . and they're still here, serving every day throughout the plant.

The trial proved that Scott Wipers provide worthwhile savings, are safer, more sanitary. Eliminate the expenses of collecting, counting and laundering of used wipers. Simplify storeroom record-keeping. And Canco management liked the thought of employees

having clean, sanitary Scott Wipers—each one *fresh from a box*, with no clinging burrs or foreign particles to cut and scratch hands and face!

Employees liked them at once. Today soft, absorbent Scott Wipers are used by machine operators, maintenance men, inspectors. They're tough enough to do wiping jobs better . . . and they're disposable, for better housekeeping. Your local Scott distributor will help you set up a test of Scott Wipers in *your* plant—or write: Scott Paper Company, Department M-79, Chester, Pennsylvania.



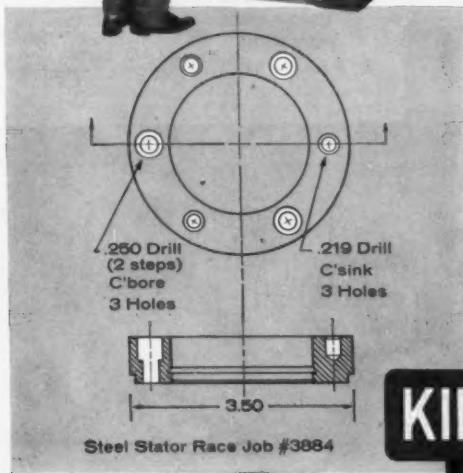
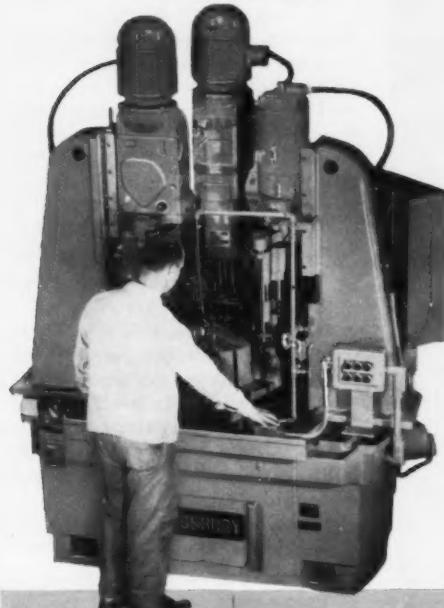
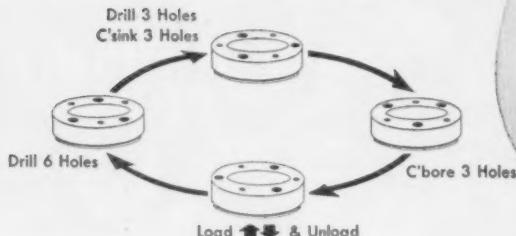
Maker of the famous Scott paper products you use at home. See "Father Knows Best" and "The Gisele MacKenzie Show" on NBC-TV.

*Automatically*

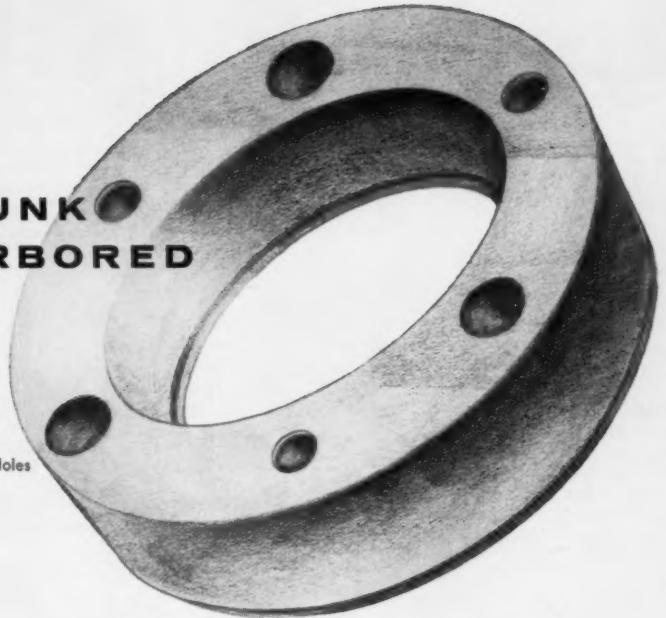
**• DRILLED**

**• COUNTERSUNK**

**• COUNTERBORED**



Steel Stator Race Job #3884



**EVERY 12½ SECONDS**

on this 4-station

**KINGSBURY**

This Kingsbury indexing automatic is fairly simple. It performs three operations on 290 steel stator races per hour (gross). Three vertical operating units have multi-spindle auxiliary heads. All tools have guide bushings to maintain accuracy. An air cylinder actuates the clamp.

Simple (like this) or complex, a Kingsbury is the best indexing automatic you can buy:

- .it will be fully tooled, ready to produce
- it will meet your specifications for accuracy and production rate
- it will pay for itself in a matter of months

We have designed, built and tooled thousands of automatic drilling and tapping machines. It is our only business.

May we come see you?

Kingsbury Machine Tool Corporation, Keene, N. H.

**KINGSBURY**

INDEXING AUTOMATICS  
for high production drilling  
and tapping

**1300 ft.**

**Transfer-matic**  
**Performs**  
**2291 Operations**  
**on V-8 Blocks**

**SECTION VI**

Blocks enter with ends exposed. After tapping ends and top, they are rotated to car position for tapping banks and sides. Final position is bottom up, for tapping pan rail and under banks.

**SECTION V**

Valve lifter holes are drilled, rough reamed, finish reamed and inspected.

**SECTION IV**

With blocks in car position, mounting pads are milled, cylinder head bank faces are drilled, chamfered and counterbored and deep oil holes are drilled.

**SECTION III**

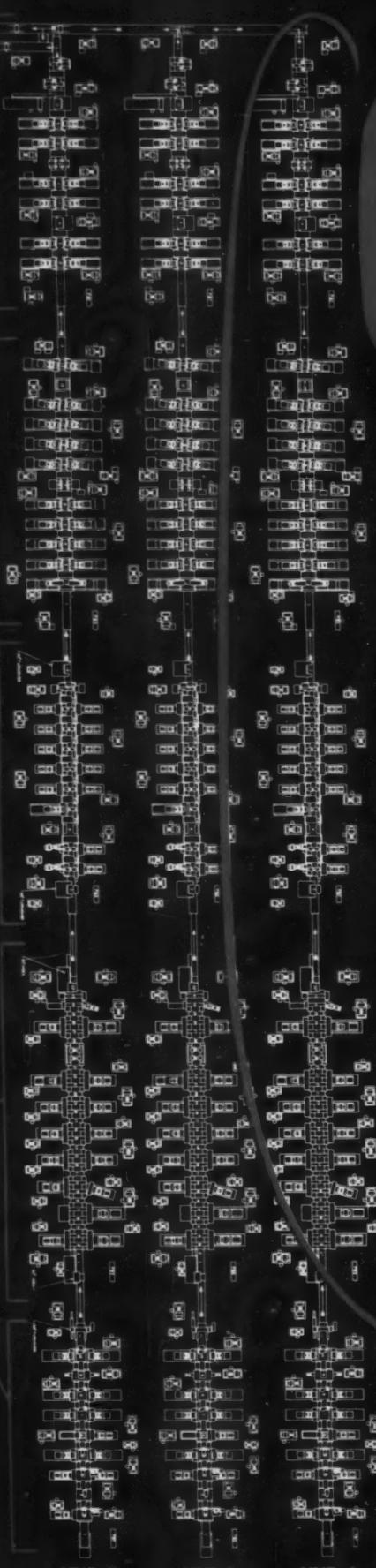
Blocks are turned on sides. Then distributor hole is rough and semi-finish bored, all holes in top are drilled and chamfered and crankshaft bearing cap holes and oil holes are drilled in bottom.

**SECTION II**

Blocks are turned 90 degrees, all holes in ends are drilled and chamfered, three oil gallery holes are pressure tested and cam shaft bearing diameters are rough bored. Then blocks are turned to car position.

**SECTION I**

Blocks enter bottom up. Oil pan screw holes are drilled, transfer spots are machined in pan rail, under banks are drilled and chamfered and blocks are turned to car position.



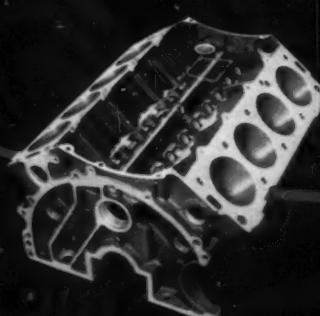
LINE C

LINE B

LINE A

Here is the answer to the automobile industry's insistent request for machine tools which will reduce the cost of model changes and shorten change-over periods. This giant "Sectionized" Transfer-matic is constructed with an entirely new set of Cross building blocks and applies new concepts of standardization to machine bases, transfers, fixtures and heads.

- ★ Capacity to machine any passenger car engine block.
- ★ 270 stations in 17 sections, each with independent controls; sections operate automatically as blocks are made available; any section may be stopped without interrupting production of others.
- ★ 2291 operations on 185 blocks simultaneously.
- ★ Rated capacity of 350 cylinder blocks per hour.
- ★ Cross Machine Control Units with Toolometers for efficient tool programming.
- ★ Pre-set tools to reduce downtime.



*Another Automation First by Cross*

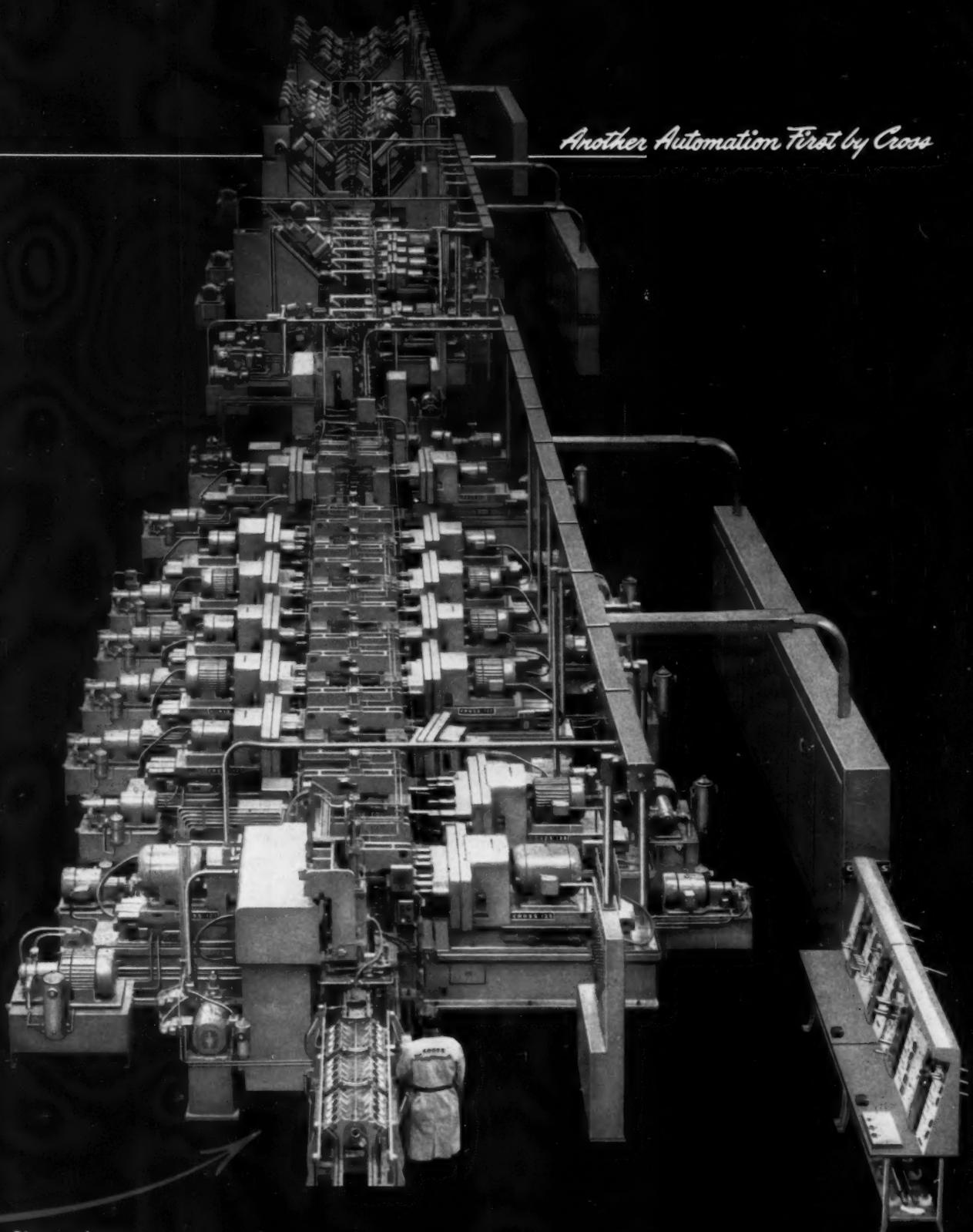


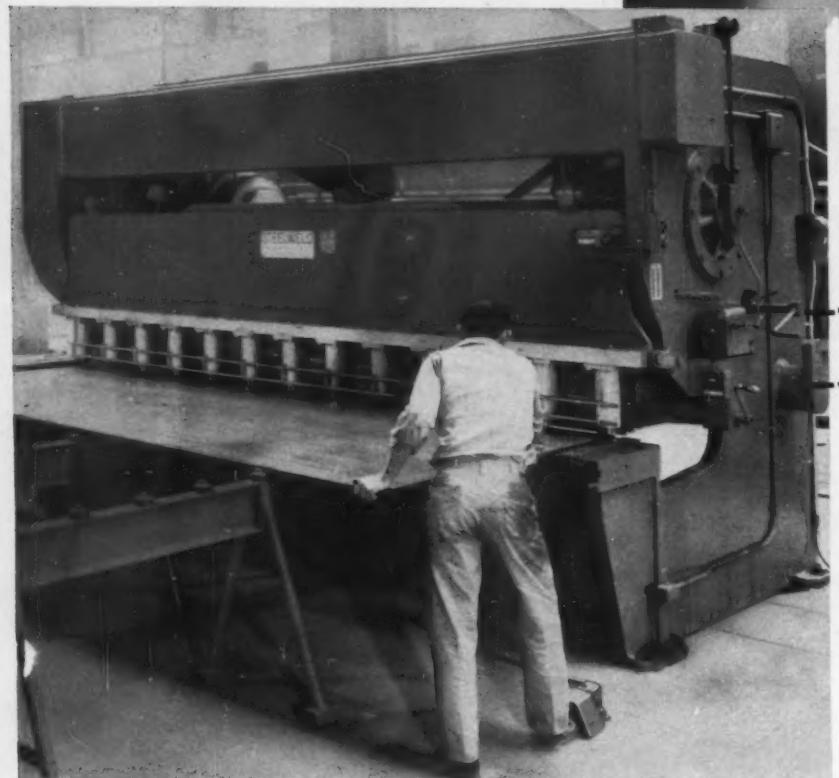
Photo shows  
Sections II, III, IV  
and V of Line A.

Established 1898

THE **CROSS** CO.  
*First in Automation*  
PARK GROVE STATION • DETROIT 5, MICHIGAN

# For The Best Cut, The KNIFE CLEARANCE Must Be Used

Steelweld Shears are available for all thicknesses of steel to 2 inches and for lengths to 30 feet. Electric foot-switch operation, as illustrated, is furnished as standard equipment.



**CORRECT**



In 10 seconds the knife clearance on Steelweld Shears can be adjusted to suit the thickness of metal being cut. It's merely a matter of turning a hand crank until the gauge pointer is on the proper figure.

**Table of  
Recommended  
Knife Clearances**

| Gauge | Steel | Stainless |
|-------|-------|-----------|
| 10    | .012  | .007      |
| 8     | .014  | .009      |
| 3/16  | .016  | .010      |
| 1/4   | .021  | .014      |
| 5/16  | .027  | .018      |
| 3/8   | .032  | .022      |
| 1/2   | .043  | .029      |
| 5/8   | .053  |           |
| 3/4   | .064  |           |
| 7/8   | .075  |           |
| 1     | .086  |           |

FOR every plate thickness there is a definite space or clearance between the knives that will produce the best result. When cutting different thicknesses of metal, it is necessary to vary the knife clearance accordingly.

One of the important differences between Steelweld Pivoted-Blade Shears and all others is the ease with which the knife clearance can be adjusted on Steelwelds. With most shears this is a major operation involving the use of measuring devices and requiring a great deal of time. Steelwelds were designed to make this adjustment simple, easy and fast. Hours of work are not required, in fact, the adjustment for any plate thickness can be made in 10 seconds.

Obviously there is no need to shear with some compromise knife clearance setting when you have a Steelweld Shear. You do not have to

accept any average cut when with such little effort you can have the best possible cut every time—sharp, straight, accurate with minimum burr. And then, too, remember that knives stay sharp longer when the proper clearance is used.

Easy knife adjustment is only one of many fine features that you will like in Steelweld Shears. For all thicknesses of plate up to 2 inches, for all lengths to 30 feet, you will find Steelwelds have much to offer.

Write for free copy of Catalog No. 2011.  
Gives construction and engineering details

**STEELWELD**



**SHEARS**

STEELWELD DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 5455 E. 282 ST. • WICKLIFFE, OHIO

## Five cylinder series... each the best of its kind!

Here you see one more reason why experienced cylinder users prefer Hannifin cylinders...there is a Hannifin cylinder series for every type of service.

What pictures cannot show you is the extra effort that goes into every Hannifin cylinder, all the way from the drawing board to the shipping dock. This brings you design features other cylinders simply do not have...superior workmanship where it's most needed for long, trouble-free service...and better delivery promises, better kept. All at prices no higher than you may have been paying for less satisfactory cylinders.

There's a Hannifin man near you—or, if the need is urgent, call us long distance. He or we will welcome the opportunity to help you as you select the Hannifin cylinder series that best meets your needs.

AIR AND HYDRAULIC

**HANNIFIN**  
POWER CYLINDERS

### COMPLETE CYLINDER FILE

Write for your copy of this new Hannifin Cylinder File...complete, easy-to-use, easy-to-order—from information on five lines of Hannifin cylinders. Write Hannifin Corporation, 509 S. Wolf Road, Des Plaines, Illinois.





Nelson uses a battery of National Acme multiple spindle automatics, Brown & Sharpe single spindle automatics, and many Nelson Vertical single spindle automatics for threading and boring its end welding studs. Various stainless and 1015 to 1020 steels are used. Each machine has rack for handy storage of steel bars. Coolant is Texaco Transultex Cutting Oil.

Bridge of composite construction, showing Nelson end welding studs fastened to I beams, ready for pouring of concrete. Studs of many sizes and shapes are flux-filled—welded with semi-automatic Nelweld gun.



## "Changing to Texaco upped production and lowered maintenance costs"

—reports Nelson Stud Welding Division, Gregory Industries, Inc., Lorain, Ohio.

**"Your lubrication engineer was right when he recommended Texaco Transultex Cutting Oil. It has reduced our machining problems to a minimum."**

This customer manufactures studs for end welding. They are forced to choose materials for weldability and service, regardless of their machinability. And this often presents tough production problems. At least it did, until a Texaco Lubrication Engineer recommended Texaco Transultex Cutting Oil.

After switching to Texaco, the customer reports, "Production has increased beyond our expectations, and maintenance costs have been substantially reduced." What's more, machines now stay cleaner, shop housekeeping is made easier.

Let your local Texaco Lubrication Engineer help you select the best cutting, grinding or soluble oil for top efficiency at lowest cost. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

★ ★ ★

The Texas Company, 135 East 42nd Street, New York  
17, New York.



# TEXACO

CUTTING, GRINDING,  
SOLUBLE AND  
HYDRAULIC OILS

- Target Defense Budget
- Target Negotiation
- Target Industry Concentration



## Keeping up with Washington

LORING F. OVERMAN

THE giant multi-billion-dollar defense budget—representing about half of the Government's anticipated expenditures for 1958—was the target of a Congressional barrage. Press time for this column found Senate and House conference committees locked over whether to drop the total to \$33,500,000,000 as passed by the House or to restore the billion dollars added by the Senate. Besides the thirteen Senate-House conferees concerned directly with the defense budget, other committees were curious as to how defense costs climb so high, in the first place.

The House Armed Services Subcommittee, studying aircraft manufacturers' profits, heard scores of witnesses testify that costs are materially increased by stop-and-go contracts, feast-or-famine buying, and by endless red-tape procedures before, during, and after a program is under way. The first witness before the committee recommended "a complete overhaul of procurement regulations." He suggested that the military be given "more freedom of action in the use of funds appropriated for their use, being held responsible for the end result of such use."

### Target Negotiation

Testimony of big-industry witnesses was in direct opposition to proposals made in new legislation introduced by Chairman Carl Vinson (D-Ga.) of the House Armed Services Committee. His proposal is "designed to restore open, competitive bidding to the nation's Armed Forces." Chairman Vinson's bill would: redefine "negotiation" in a manner assuring open, competitive bidding—require the Defense Department to formulate uniform procurement regulations—cancel existing authority for the military to negotiate under a national emergency declared by the President. Such blanket authority would be granted only during an emergency declared by Congress.

Investigating committees found that 90 per cent of defense contracts are negotiated; only 10 per cent are awarded through competitive bidding. Critics of negotiated bids contend that the cost to the taxpayer is greatly increased by this procedure. Military spokesmen disagree. They point out that in many instances, only one or two suppliers can produce the item sought. Thus, if full and unrestricted bidding were required, the single supplier could charge exorbitant prices.

The Senate's proposal, an amendment to the Defense Department appropriations bill, specifies, "Provided, however, that none of the funds appropriated in this act shall be used except that, so far as practicable, all contracts

shall be awarded on a competitive basis to the lowest responsible bidder."

### Target Concentration

Public hearings on the effects of increasing concentration of American industry are likely as a result of the publication of a 756-page report by the Senate Judiciary Antitrust Committee. Machine tool and metalworking machinery manufacturers appear to have shared this trend, according to committee tabulations. Major customers of the machinery builders are also seriously involved. Based on Census of Manufacturers reports for 1954, the study shows that the one hundred largest manufacturing companies in the United States accounted for 30 per cent of the dollar value of all manufactured production. This is an increase of 42 per cent over 1947, when the same companies reported only 21 per cent of the total.

Shrinkages in the small business field have troubled Washington for some time, and the expected hearings on this latest evidence of concentration may help crystallize methods to redistribute defense orders and to aid small business.

### Small Business Tax Aid

Despite repeated statements that no tax changes can be made "if substantial reductions in Federal revenues are involved," the President has proposed four relief measures for small business. The proposals, said to represent \$300,000,000 in tax savings for small business, are included in a letter to Chairman Jere Cooper (D-Tenn.), Chairman of the House Ways and Means Committee. The recommendations are:

That businesses be permitted to use, for purchases of used property not exceeding \$50,000 in any one year, the formulas for accelerated depreciation contained in the Internal Revenue Code of 1954.

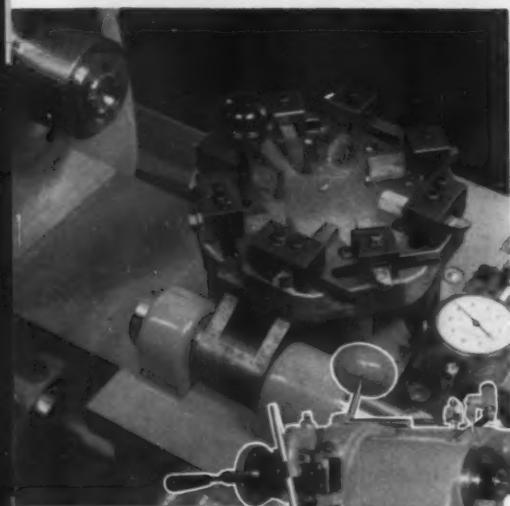
That corporations with ten or fewer stockholders be given the option of being taxed as though they were partnerships.

That the taxpayers be given the option of paying the estate tax over a period of up to ten years in cases where the estate consists largely of investments in closely held business concerns.

That an original investor in small business be given the right to deduct from his income, up to some maximum amount prescribed by Congress, a loss, if any, realized on a stock investment in such business.



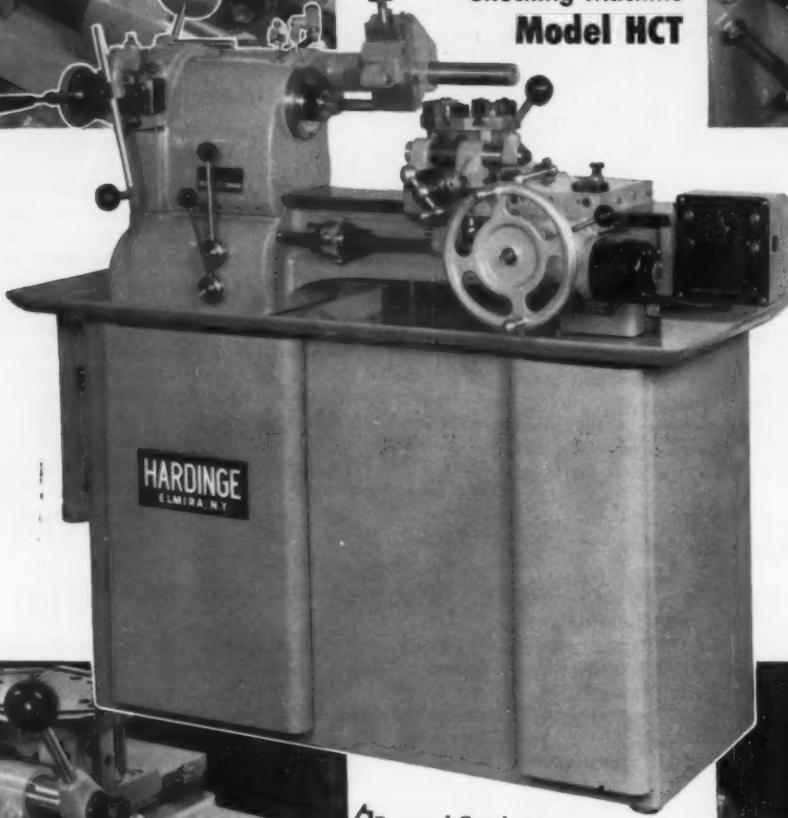
# "Closer Tolerances Increase Demand for the HARDINGE HCT Precision Chucking Machine"



8-Station Turret

Flexible Range of Operation

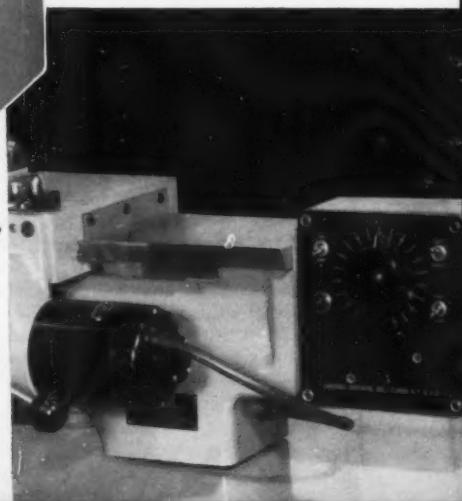
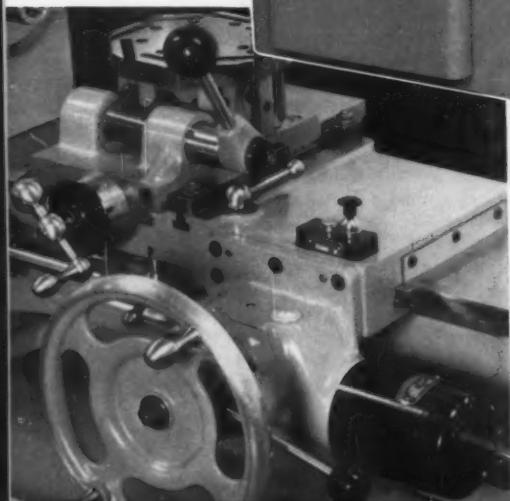
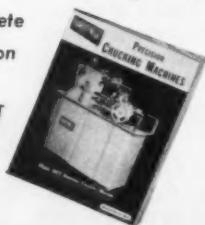
High Speed Precision  
Chucking Machine  
**Model HCT**



Rugged Carriage

Independent Variable  
Carriage Feed

For complete  
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write for  
Bulletin HCT



Hardinge Model HCT  
Precision Chucking Machine  
finishes diameters, recesses,  
shoulders, back faces,  
front faces, and  
cuts precision threads  
in one setting - all concentric  
with each other.  
Tooled inexpensively with  
standard tool bits.

**HARDINGE BROTHERS, INC., ELMIRA, N. Y.**  
PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

## *What Makes the Small Shop Tick?*

MECHANICAL ingenuity of high order is a prime requisite in many small machine shops that do job work. In an establishment of that category it is frequently necessary to perform operations with makeshift devices because equipment designed specifically for the needs of a particular job is not available. In larger shops, the right machine can be assigned for almost any job.

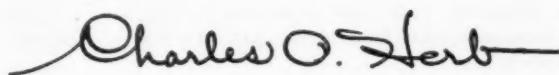
So it is often necessary for the small-shop machinist to improvise work-holding methods and make up special tools to suit the job. Nearly always the cost of preparing for the machining operation is a matter of considerable importance. Resourcefulness is, therefore, a highly desirable quality in foremen and machinists of small shops.

The National Bureau of Standards in Washington maintains a machine shop of appreciable size which is called upon to produce components for the scientific instruments and equipment originated by the scientists of the Bureau. Existing production equipment must be constantly modified to perform unusual work.

A characteristic example of the ingenuity exercised by the personnel of this shop lay in the solution of a problem concerned with making bronze heat-dispersion coils. These coils were about 16 feet long and had to be 1 inch in diameter to fit into glass tubes. The coils had to be fairly uniform in pitch and each flat coil surface had to have a number of holes to allow for the passage of fluids and even dispersion of heat.

This knotty problem was solved by making the coils from continuous chips turned from bronze bars through which holes had been drilled around the axis. A hole drilled through the center of the bar insured clean edges along the inside diameter of the coil. No additional work is necessary to prepare a chip for functioning as a heat-dispersion coil.

Full details of this operation and of other unique practices followed in the Bureau machine shop are given in the leading technical article of this number of MACHINERY. The ingenuity displayed in solving various problems is the essence of what makes the small shop tick.



EDITOR



**"Here's a hot one for the slitters**

## **60,000 lbs. of slit coils... delivered early tomorrow!"**

**A TRUE STORY of Ryerson service—the kind that makes Ryerson your best source for every steel requirement.**

It was ten after five. The phone rang and a steel buyer 80 miles away said: "I've simply got to have 60,000 lbs. of slit coils first thing in the morning."

Impossible?

Not at Ryerson. This kind of service is what Ryerson customers have learned to count on when emergencies arise.

The needed steel was on hand in Ryerson stocks. Unequalled slitting equipment was put to work. And during the night two different gauges of steel

coils were slit to meet two size requirements. Early next morning the steel was delivered *as promised* . . . 80 miles away.

You don't have to wait for an emergency to appreciate Ryerson service. Our stocks and processing facilities enable us to meet practically every demand for steel—no matter what the shape, size, quantity or time requirement.

In addition, you can always depend on Ryerson for steel of high uniform quality.

So call your nearby Ryerson plant for steel or help on steel problems with the assurance of close personal attention by specialists who make your problems their own.

*In stock: Carbon, alloy and stainless steel—bars, structural, plates, sheet and strip, tubing, re-bars—industrial plastics, machinery & tools, etc.*



# **RYERSON STEEL**

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA • CHARLOTTE • CINCINNATI  
CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

# TOUGH PROBLEMS

## Solved with Tricky Tooling



Attachments for wide-angle taper turning, jig boring on a vertical milling machine, and roll-forming have been developed by the Bureau of Standards shop personnel for producing scientific instruments and equipment.

FRANK P. BROWN, Chief, Central Instrument Shop

CARL E. PELANDER, Instrument Maker

National Bureau of Standards

U. S. Department of Commerce

Washington, D. C.

A HIGH degree of skill and considerable ingenuity are essential requirements of shop personnel at the National Bureau of Standards. Unusual and often unique problems are constantly being brought to these men by the Bureau's scientific staff. Such problems frequently entail the production of components

for scientific instruments and equipment. The details for such components are generally presented in the form of a cursory explanation or, if the shop man is fortunate, a rough sketch.

In an attempt to bring about a closer understanding between shop men and scientific personnel, a comprehensive educational program is pro-

vided. Courses are offered in physics, strength of materials, electronics, and similar subjects so that the shop men can relieve the engineers of considerable routine work. New or improved methods of making extremely accurate parts are constantly being sought, and existing production equipment is continually being modified to perform unusual work.

Since detailed drawings are not available for most of the parts to be produced, it is not normally feasible to subcontract the work to commercial shops. Also, most of the scientific projects are of sufficient importance to demand immediate delivery. Another deterrent to having the work done outside is that many of the parts must be made from alloys that have been developed for a specific purpose, and that are not commercially available. Some of the ingenious attachments developed in the Shops Division for producing a wide variety of parts on existing machine tools will be described in this article.

#### **Wide-Angle Taper-Turning Attachment**

There have been a number of occasions when the Bureau's shops have been called upon to make parts having tapers greater than the ca-

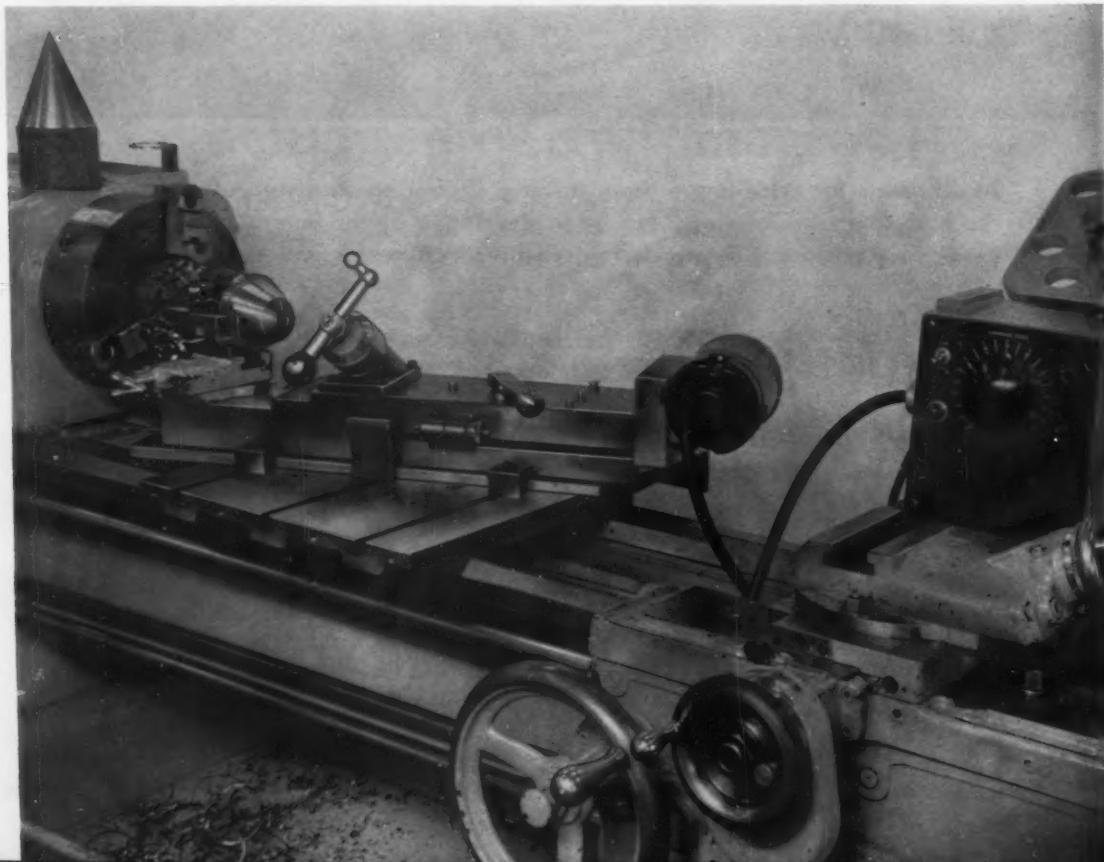
pacity of the taper-turning attachments fitted to the available lathes. It has been common practice to cut such steep tapers by adjusting the compound rest and using the cross-slide on the lathe. However, hand feeding of the tool makes such operations laborious and very often—particularly on long tapered surfaces—an unsatisfactory surface finish is produced on the work-piece.

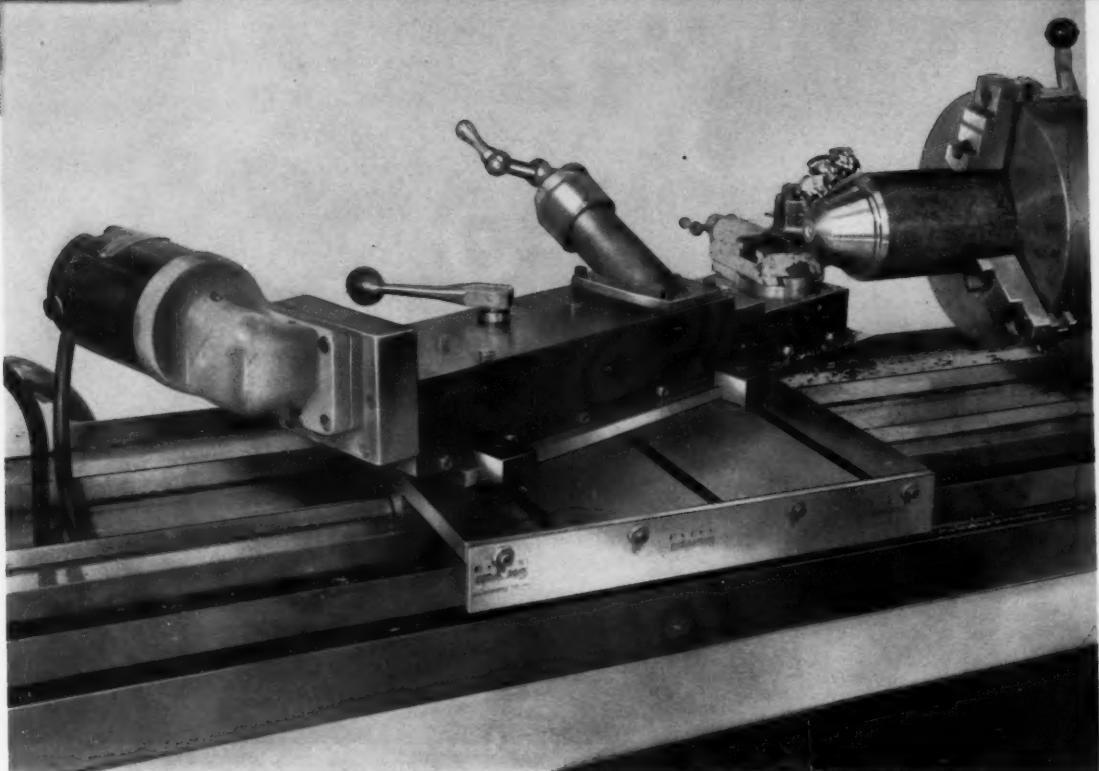
To solve these problems, the Shops Division designed and built a special wide-angle, taper-turning attachment. The attachment is shown in Fig. 1, adapted to a 12-inch lathe for cutting a 45-degree taper on a bar of air-hardening tool steel. However, the unit can easily be applied to smaller or larger lathes if necessary.

An auxiliary table having transverse T-slots in its upper surface is clamped to the bed of the lathe, as seen in Fig. 2. The under side of the table is provided with vees to match the V-ways on the lathe bed, and its outer edges are accurately machined parallel to the ways for use as precise locating surfaces in setting up the attachment to the required angle.

Mounted on the auxiliary table is a dovetail slide having a flat base that is clamped to the table. Prior to clamping, this base is set to the required angle with relation to the locating edges

**Fig. 1. Wide-angle taper-turning attachment, adapted to a 12-inch lathe, can be set at any required angle up to 180 degrees.**





**Fig. 2. Power for taper turning is provided by a variable-speed, lead-screw feeding mechanism. A hand-feed device is also mounted on the unit.**

of the table by means of any convenient angulating device, such as a vernier protractor or a sine bar. A compound rest for regulating the cutting depth of the tool is mounted on one end of the upper slide member.

Power for the taper-turning attachment is supplied by a commercially produced electric variable-speed lead-screw feeding mechanism. The stationary nut of this mechanism is anchored to the slide base, and the upper slide member is screw fed at any desired rate by means of an electric motor mounted on the outer end of the slide. Feed rate is adjusted by an electrical control unit mounted on the lathe cross-slide (right in Fig. 1).

A hand-feed mechanism with a dial graduated in thousandths of an inch is also provided on the taper-turning attachment. In addition, an adjustable stop is provided on one side of the slide to limit the travel of the cutting tool. A total travel of 10 inches is possible, and the slide can be set at any desired angle up to 180 degrees.

#### **Vertical Milling Machine Adapted to Jig Boring**

The large number of precision drilling, reaming, milling, and boring operations required on the various components for scientific instruments

very often presents an overload for the existing jig-boring machines. To overcome this bottleneck, an attachment was made to permit precise work on a vertical milling machine, Fig. 3.

Essentially, the attachment consists of a low-power microscope mounted on a bracket attached to the milling machine head with the optical axis of the microscope parallel to the spindle axis. A master template, carefully prepared to extremely close tolerances on a measuring instrument and optical comparator, is clamped on the compound slide of a watchmaker's lathe. This slide, mounted on the milling machine table, permits transverse and longitudinal adjustments of the template with relation to the work-piece.

Actual movement of the work-piece with relation to the positions indicated on the master template is done by controlled movement of the milling machine table. Also, in the case of this particular machine, it is necessary to raise the machine table to bring the work into contact with the cutting tool. Center distances between the 1/8-inch diameter holes in the part illustrated are held to 0.0005 inch of the dimensions specified.

An outstanding example of the ingenuity exercised by shop personnel was in the production of bronze heat-dispersion coils. These coils, two different types of which are seen in the operator's hands in Fig. 4, were required to fit in glass tubes

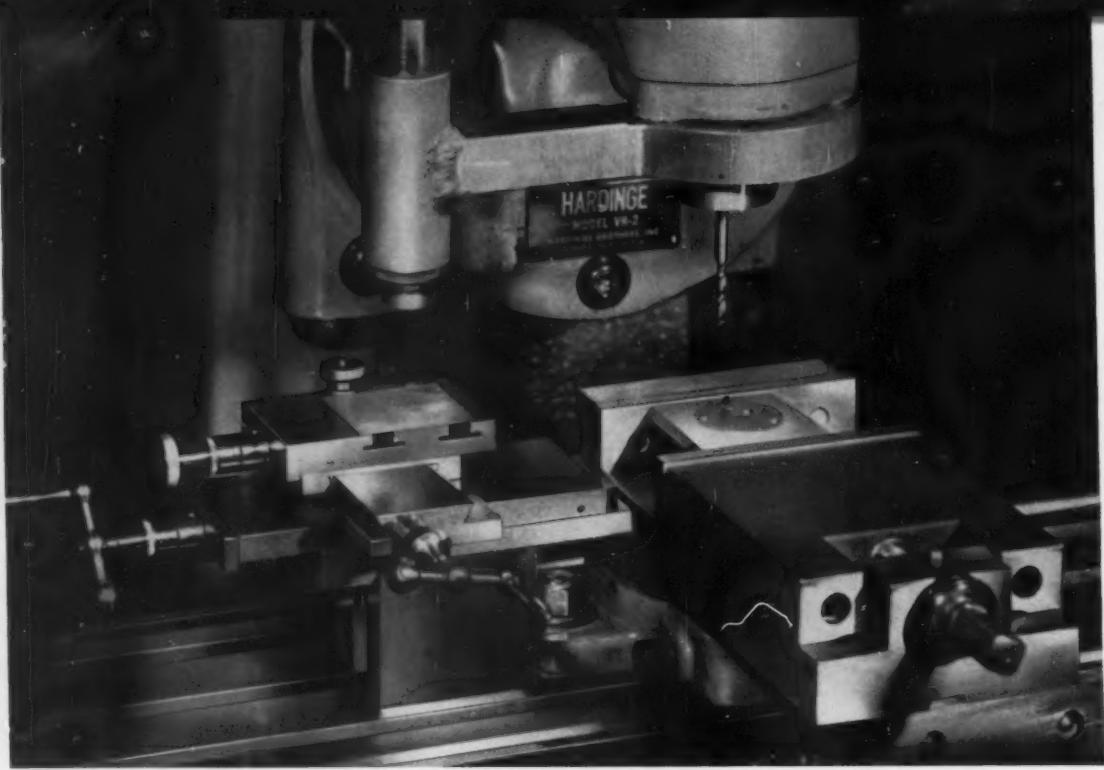


Fig. 3. Low-power microscope is mounted on a bracket attached to vertical milling machine head to permit precise drilling and boring work.

approximately 16 feet long and slightly more than 1 inch in diameter. It was necessary that the coils have a relatively uniform pitch, and that their flat surfaces have holes to allow the transmission of fluids and the even dispersion of heat.

This knotty production problem was solved by making the coils from continuous chips that were cut from predrilled bar stock. A bronze bar slightly larger in diameter than the required coil was used. Holes were drilled in a circular pattern about the bar axis, and one into the center to prevent the formation of a ragged edge in the bore of the coil.

With the bar chucked in a lathe as shown, a single-point cutting tool with a sharp rake angle specially developed for this purpose is fed into the bar at a predetermined rate to cut the coil. The coil can be considered as a long continuous chip, with the depth of cut being equal to the full radius of the bar. As the chip is cut from the bar, it is supported by an aluminum-angle trough that is clamped to the tool-holder.

Since it was not necessary to make each coil a continuous 16-foot length, the chips were produced in 18-inch lengths for ease of handling. To finish the coils, the chips were compressed on a specially designed mandrel and their peripheries turned down so that they would fit inside the glass tube.

Another interesting device designed and developed in the Shops Division is the ball-turning

unit seen in Fig. 5. The device is used in a lathe with the base clamped in the position of the tool-post, so that its pivoting axis is in the same plane and perpendicular to the spindle axis of the lathe. Also, the cutting face of the tool is positioned in a vertical plane passing through the work axis.

With the device set up as illustrated, it is used for turning highly accurate spherical surfaces. By changing the position of the tool, concave surfaces can be machined. The tool is fed manually by means of a worm and worm-wheel drive.

#### **Roll-Forming of Thin-Wall Conical Components**

A roll-forming technique developed at the National Bureau of Standards to produce thin-wall conical components is illustrated in Figs. 6 and 7. As shown in Fig. 7, parts can be formed to a sharp apex, if required, and no pressure pads are necessary.

The operation is performed on a modified turret lathe, with the forming roll (mounted on the end of a 4-inch square, solid steel ram) being traversed through compound linkage by means of the turret feed mechanism. While the unhardened, cold-rolled steel roll is mounted rigidly on the ram, it is free to rotate with the work-piece. The ram bearing housing is mounted on the bed of the lathe.

**Fig. 4. Bronze heat-dispersion coils are produced from pre-drilled bar stock in the form of continuous chips. Chip is supported by trough.**



The most distinguishing feature of this roll-forming technique is a unique sliding collet arrangement for holding the blank and resulting work-piece. This arrangement consists of a collar into which the blank is placed prior to screwing the collar on the end of a sliding sleeve. The sleeve fits over the formed rolling mandrel and slides axially along the mandrel as the blank is being roll-formed. However, the sleeve is keyed to the mandrel, and is rotated with the work.

While this process is not intended for production needs, it has proved very successful in facilitating the small-lot output of laboratory components requiring shapes producible by this method. The feeds and speeds used for this operation are governed by the thickness and material formed.

After many unsuccessful attempts to grind a specimen 1/16 inch in diameter by 3 inches long from a 3/8-inch diameter ferrite bar, the problem was solved by adapting an extremely fine feeding arrangement to a No. 2 cutter and tool grinding machine, Fig. 8. With conventional methods, the slim ferrite rod would snap from the bar. All of the stock—5/32 inch of radius—is now removed in one pass, but the grinder table on which the work is held and rotated is fed longitudinally at a rate of only 0.032 inch per minute.

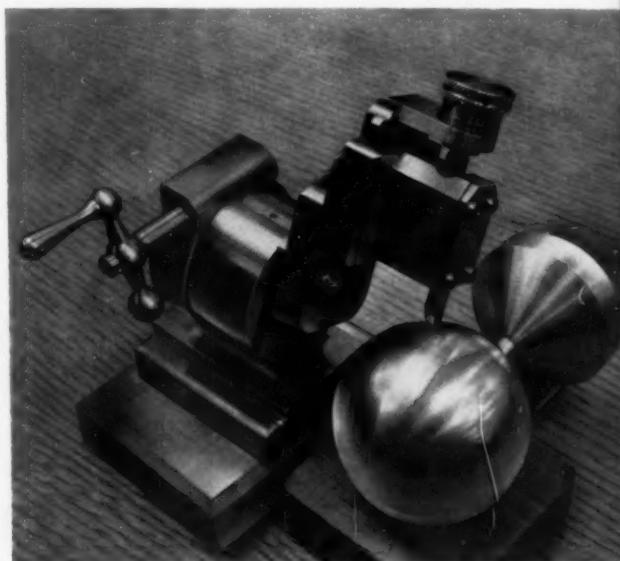
This fine feed is accomplished by means of a small motor from a watchmaker's lathe, a gear reduction unit, a variable-speed control, and connecting belts. The variable-speed unit, mounted

on the right-hand end of the grinder table, supplies power to the small motor located on the machine saddle. One belt connects a small-diameter pulley on the motor shaft to a large-diameter pulley on the input end of the speed reducer. The output end of this reducer is belted to the manual feed drum of the grinder to obtain the required slow table feed. A 6-inch diameter, diamond-faced cup wheel, rotating at 3300 rpm, is used for this operation.

#### **Special Tool-Holder and Base Developed for Ceramic Tools**

The variety of problems presented to the Shops Division often require unorthodox machining pro-

**Fig. 5. Ball-turning unit is clamped in a lathe in place of toolpost for spherical turning. Same device can be used to cut concave surfaces.**



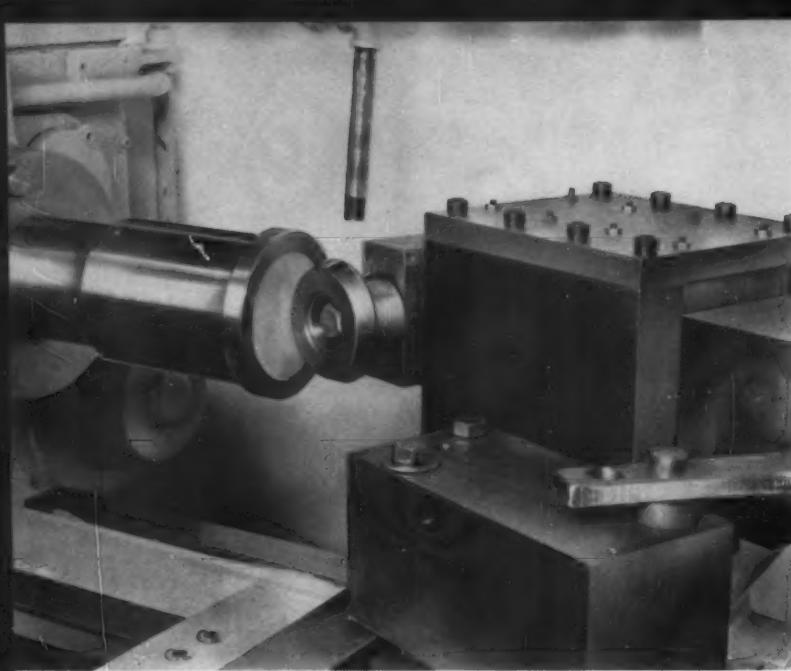


Fig. 6. Modified turret lathe set up for roll-forming thin-wall conical parts. Forming roll is mounted on the end of a square ram.

cedures, and personnel are constantly on the lookout for new techniques and cutting materials. When ceramic tools were introduced, they were investigated in the hope that they would prove helpful in machining titanium alloys and heat-resistant materials containing high percentages of nickel and chromium.

However, considerable difficulty was encountered with various setups, and it was found that lack of tool rigidity was the main problem. To overcome this, a special tool-holder and base were designed to fit the lathe—seen in the head-

ing illustration—that had been set aside for such operations. The compound rest of the lathe has been removed and replaced by a massive base on which is mounted an equally solid tool-holder block, Fig. 9.

The tool-holder itself, secured to the block by means of four socket-head cap-screws, is designed for easy removal of bits and adjustment for slight variations in bit sizes. A carbide insert is provided for the bit to rest on, and the bit is clamped by means of a wedge-shaped member that is pulled against the bit by a screw in the side of

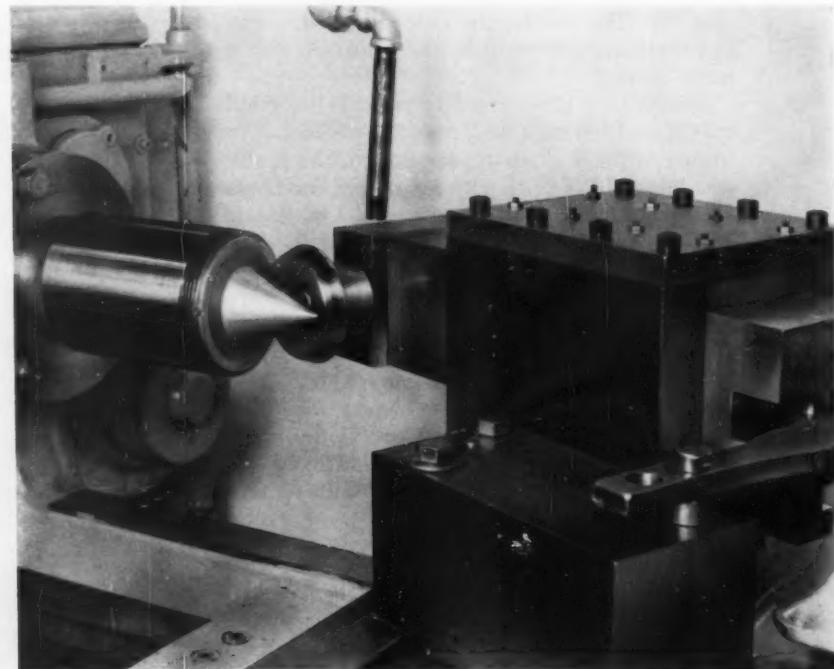


Fig. 7. Collar for retaining the blank has been removed in order to show the roll-formed part. The roll is traversed through a compound linkage by turret mechanism.

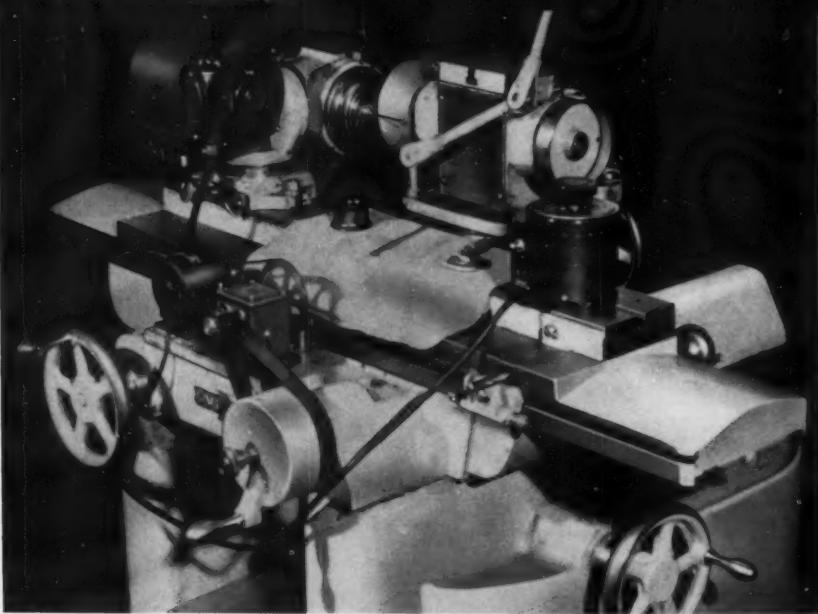


Fig. 8. A feed as small as 0.032 inch per minute is obtained on this grinder by means of a variable-speed control, a small motor, and a gear reduction unit.

the holder. The screw seen in the back of the holder is used to accommodate different bit sizes. While the holder illustrated is designed for square bits, a similar one has been provided for round bits. A 5-degree negative rake is provided by the holder design.

In machining one titanium-alloy bar, 1 1/2 inches in diameter, the work was rotated at 400 rpm and the ceramic tool was fed at the rate of 0.020 inch per revolution. For finishing, the work speed was increased to 1000 rpm and the feed rate was reduced to 0.004 inch per revolution. Good results were obtained with these feeds and speeds, and negligible work-hardening of the material was experienced. In turning a chromium steel bar 4 inches in diameter, a rough cut 0.075

inch deep was made at a speed of 260 rpm and a feed rate of 0.013 inch per revolution. For finishing, the depth of cut was reduced to 0.101 inch, the speed was increased to 600 rpm, and the feed rate was decreased to 0.004 inch per revolution. This resulted in a sufficiently fine surface finish so that a proposed grinding operation was eliminated. The original specification in this instance required a 16 micro-inch finish, and while the resulting finish was not precisely checked, it was acceptable to the scientific division.

In conclusion it might be added that some of these special techniques are devised to produce instruments or parts thereof from limited available stocks. Also, the work-pieces are generally required on short notice,

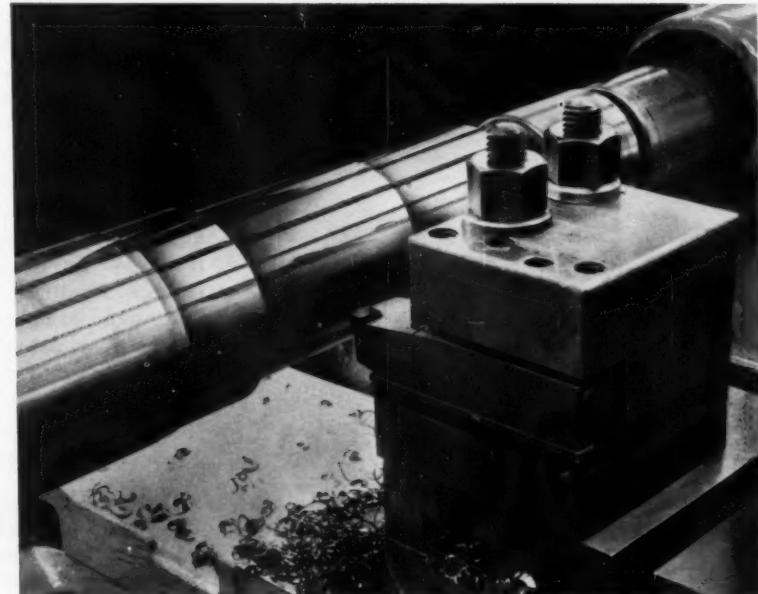


Fig. 9. Massive tool-holder and block designed to insure rigidity when using ceramic tools to cut titanium alloys and heat-resistant materials.

# ELECTROLYTIC GRINDING

## Pays Its Way in Just One Day

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FLUORESCENT penetrant inspection of turbine buckets for jet engines produced at the Evendale, Ohio, plant of the General Electric Co. showed that a considerable number of buckets were cracked on the root flats of the dovetail, as indicated in Fig. 1. Sample buckets were cut into sections and analyzed metallurgically to determine the nature and extent of the damage. Cracks 0.003 to 0.020 inch deep in the highly stressed surface were revealed. This damage had been caused by abnormally severe grinding conditions—rapid stock removal with insufficient coolant.

Naturally, an item as critical to the functioning of an aircraft gas turbine as the turbine buckets is subject to rigid quality control. Any sign of cracking means immediate rejection. An excessive manufacturing loss would result since the buckets are composed of a highly critical and expensive material and considerable labor had been expended in their production. Reworking of these buckets could prevent at least a \$15,000 loss.

Examination of the rejected buckets revealed that 0.005 to 0.010 inch of stock could be removed

from the root flats without exceeding the dimensional tolerances. The job was to save these buckets. First attempts to remove the cracked surface were made with conventional grinding operations using various feeds and speeds. Wheels and coolants were changed; abrasive belts were tried; the results were the same—an extension of the deleterious cracks. It became obvious that each attempt continued the damage to the already highly stressed surface of the buckets. This material had to be removed by some method which would not induce additional stresses.

Recently, a surface grinder was purchased to develop the electrolytic grinding process as a possible solution for certain difficult manufacturing problems. The electrolytic grinding equipment illustrated in Fig. 2 consists of a DoALL surface grinder and an Anocut electronic control. The surface grinder was adapted to the Anocut electrolytic grinding process by insulating the wheel-spindle from the rest of the machine (Fig. 3). The negative connection from the electronic control unit to the wheel-spindle is made by heavy-duty brushes. The electrode wheel is, therefore, negative with respect to the work-table which is connected to the positive pole of the control unit.

In the Anocut process of electrolytic grinding, the work-piece is the anode and the conductive grinding wheel is the cathode. An electrolyte replaces the usual coolant. High current at low voltage removes the material electrolytically. Plating of the metal from the work-piece onto the electrode wheel is deliberately avoided by dissolving this material, as it is removed, into the electrolyte. The removed metal combines with other elements present in the solution to form sol-

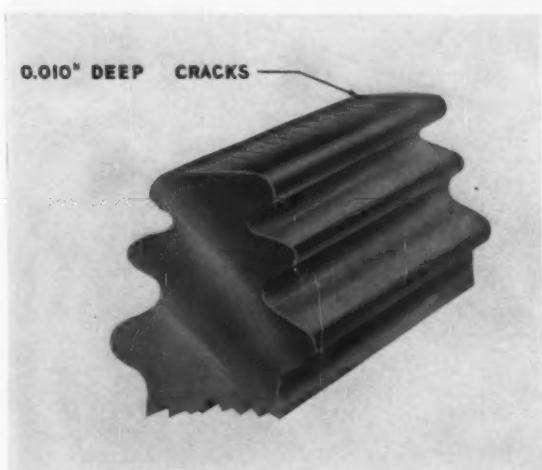


Fig. 1. Cracks located in the bottom of the root section of turbine buckets made for jet engines were revealed by visual inspection with a fluorescent penetrant.



**Fig. 2.** Experimental set-up for electrolytic grinding equipment. Here, the operator is taking a 3/8-inch cut on a piece of stainless-steel honeycomb material having an 0.002-inch wall thickness.

uble salts. Accurate control of dimensions is obtained by contact of the work-piece with the abrasive particles in the electrode wheel. The distance these insulating abrasive grains protrude from the metal electrode wheel controls the voltage gap between the electrode wheel and the work. The action of the abrasive wheel keeps electrolytic removal of the material continuous.

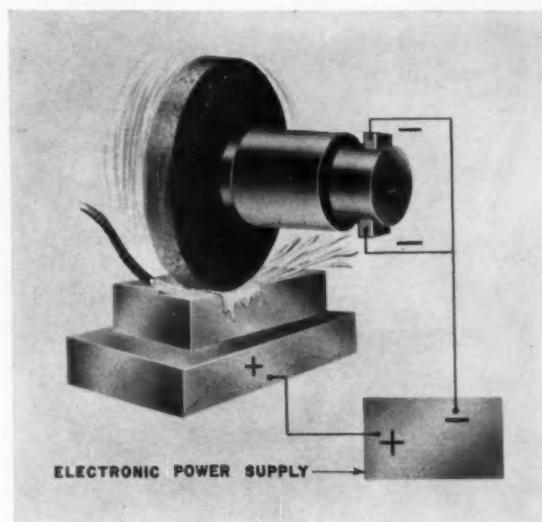
Preliminary tests of the electrolytic grinding process had been conducted by grinding Type 403 stainless steel, Armco 17-7 PH and Lapelloy. Laboratory examination of the test pieces revealed that no change had occurred in the hardness or the microstructure of the metal in producing the new surface.

The ability of electrolytic grinding to remove metal without inducing stresses made the process a likely solution for the problem. Through the use of angle-plates and C-clamps, the holding fixture from a production grinder was adapted to the grinding machine used in the tests. Varying amounts of metal, from 0.005 to 0.010 inch in depth, were removed in one pass by employing a table speed of approximately 5 inches per minute. A 150-grit diamond electrode wheel, 10 by 3/4 by 3 inches, operating at 5000 surface feet per minute was used. Electrolyte was a solution of Anocut E-7 salts and water.

Micro-analysis of an etched cross-section of a bucket root flat ground by the electrolytic method showed no change in the microstructure of the

surface. In addition, the deleterious cracks were found to be completely removed. Inspection of the electrolytically ground surfaces with a fluorescent penetrant revealed that all cracks had been eliminated except in those buckets where the damage extended below the material that could be removed. These buckets had to be scrapped.

The savings realized in labor and critical material by the use of electrolytic grinding in this one instance almost equaled the amount spent on the experimental grinding machine. Plans have been made to exploit this process in the grinding of metallic honeycomb, super alloys, tungsten carbides, and other materials that present serious machining problems.



**Fig. 3.** Basic circuit for the electrolytic grinding process. Wheel-spindle is insulated from machine. Electrolyte, which replaces the coolant, dissolves the metal as it is removed.

# DOUGLAS' \$2,000,000 TOOL-ROOM

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(Above) Machining a jig component for a base structural member of the DC-8 Jetliner on a De-Vlieg Spiramatic Jigmil. The automatic positioning arrangement enables settings to be repeated within specified limits of 0.0002 inch. Holes are conveniently bored to required depths by employing the turret stop device.

(Left) Forged component of a main landing gear for a DC-8 Jetliner being machined on a Giddings & Lewis boring, drilling, and milling machine equipped with a tilting angle-plate that provides adequate means for holding work accurately in the required angular positions.

Turning a laminated "Richlite" blank on an Axelson lathe having spindle raised 3 inches over the conventional model. This is the first stage in producing a dome-shaped part around which an aluminum sheet will be spun.



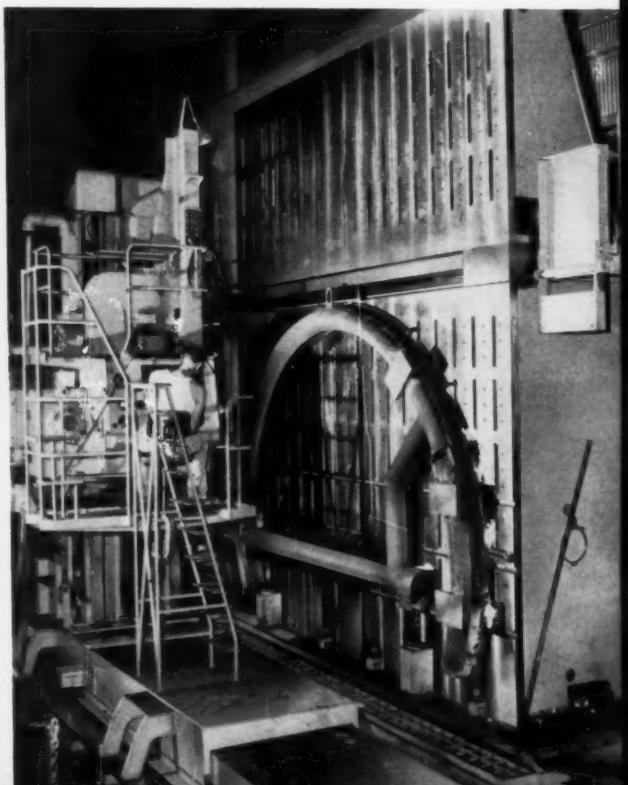
**I**N spite of continued normal replacement of equipment in the tooling machine shop at Douglas Aircraft Co., Inc., Santa Monica, Calif., the precision required for guided missile production was not always attainable in the most efficient manner. To provide adequate facilities for this program and to meet tooling requirements in building the new DC-8 Jetliners, over two million dollars has been expended during the last three

years in the replacement and acquisition of late type machine tools. About eighty pieces of equipment have been purchased and the average machine in the shop is now less than two years old.

Today, this shop, which produces tooling of all types and prototype parts, is a completely modern installation. Although considerable maintenance and a few emergency jobs are handled, no production work is done on this equipment.

Requiring five holes, each in a different plane, a master tooling block is being finished on a SIP Hydroptic precision jig boring machine. The tilting rotary table facilitates the positioning of work-pieces that must be located in various angular planes.

Tooling stations on a section of a fuselage assembly jig being established on a Pratt & Whitney 7- by 14-foot Keller machine. The special angle-plates extend the full travel of the machine. The top half of the pattern-holder can be manually positioned by lead-screws.

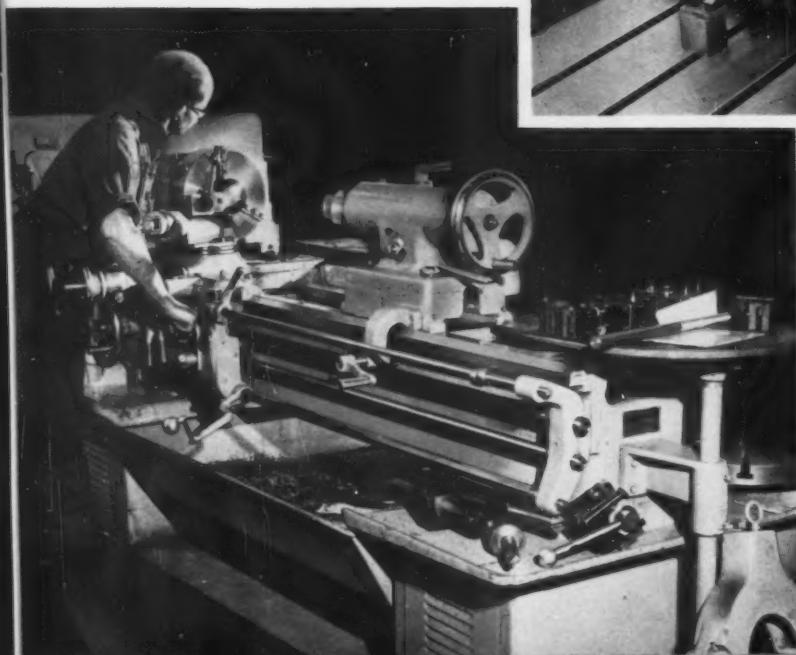




(Left) Generating the contour of a cam for a spiral template unit that is employed to control the heads of a Farnham spar mill in the machining of spars for the DC-8 Jet-liner. The Kearney & Trecker vertical milling machine finishes the cam to the required contour by using a rotary table actuated by special gearing.

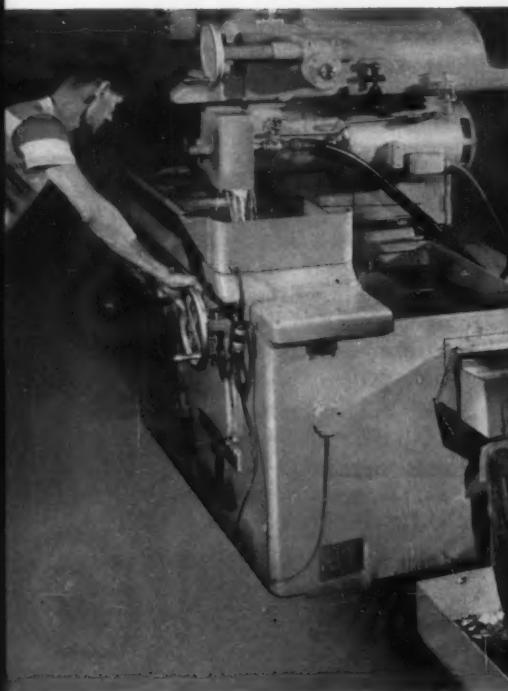


(Right) Special Sundstrand milling machine equipped with universal overarm attachment being used for contour-milling an experimental part of intricate design typical of prototype parts that are turned out in an aircraft plant's tool-room.



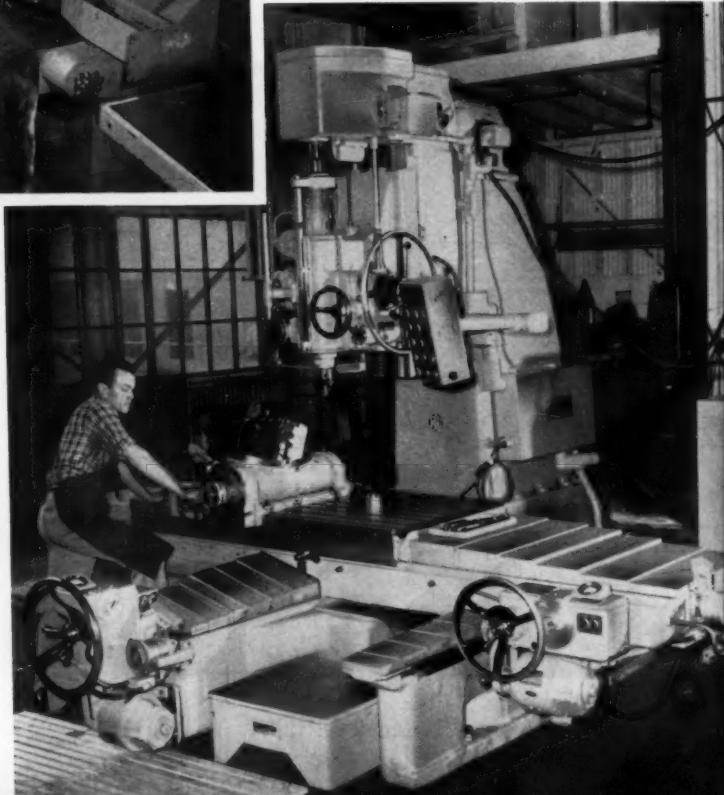
(Left) Facing a die-shoe on one of a line of six Sidney lathes is representative of a large variety of tool-room jobs handled in this type of machine. The hydraulic headstock and speed selector enable fast speed changes to meet economical operating requirements.

(Right) Surface milling a DC-8 window frame on a Cincinnati vertical milling machine. The part is precisely positioned at three points and voids under the part are packed with Hydrocal (plaster) which sets up quickly and prevents vibration during the operation. The long inch-scale on the table gives a visual check of longitudinal travel.



(Left) Rolls for Yoder forming machines are ground on this Thompson surface grinder. Grit and metal particles are removed from the coolant by the Barnes-driL "Kleenall" filter at the right, thus enabling recirculation of clean coolant and avoiding wheel loading and abrasion from grit.

(Right) The Electrolimit measuring system which is built into this Pratt & Whitney precision jig borer and the tilting rotary table facilitate the machining of many of the complicated parts for both guided missiles and DC-8 Jetliners within today's close tolerances.



# A New Approach to Carbide Boring Bit Angles

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A MANUFACTURING concern made up a number of carbide-tipped forming tools, such as the one shown in Fig. 1, to perform facing and chamfering operations simultaneously on the part seen in Fig. 2. The mortality rate of these tools became excessive because the direction of the cutting stresses would fracture the carbide tip as shown at A (Fig. 1). Also, the opposing flow of the chips contributed to their short life.

This problem was solved by using a combination of standard carbide-tipped tools, as shown in Fig. 2. Production has been increased tremendously—and that at less cost! Previously, this operation was a bottleneck in the group of machines performing various operations on a missile component. Now, the standard carbide tools operate for days at a time without requiring attention.

An important factor in the successful operation of this combination of tools is the boring bit.

Often, the tool-bit slot in the boring-bar is located so that the cutting edge is above center. Unless the back-rake angle and the front-clearance angles are properly ground to compensate for off-center location of the boring bit in the bar, the carbide-tipped tool is headed for quick destruction. Carbide tips demand designs that take advantage of their high compression qualities and, at the same time, eliminate or reduce tensile stresses.

Examples of this type design are shown in Fig. 3. The four boring bits shown across the top are designed to bore, for example, holes  $1\frac{1}{2}$  inches in diameter. The end views of the boring-bars have been omitted for the sake of simplicity. It should be particularly noted that the back-rake (BR) angles are at right angles to lines tangent to the bores at the cutting points. However, the degree of the BR angles varies with the size of

Fig. 1. Carbide-tipped tool for facing and chamfering would fracture, as seen at (A).

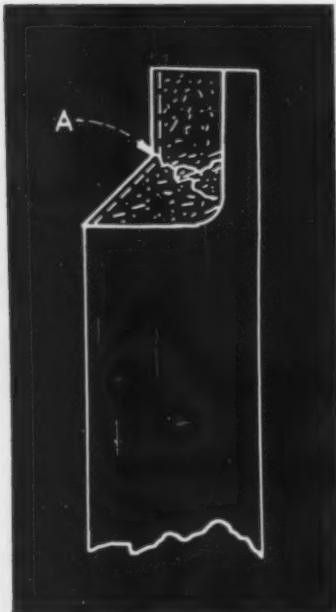
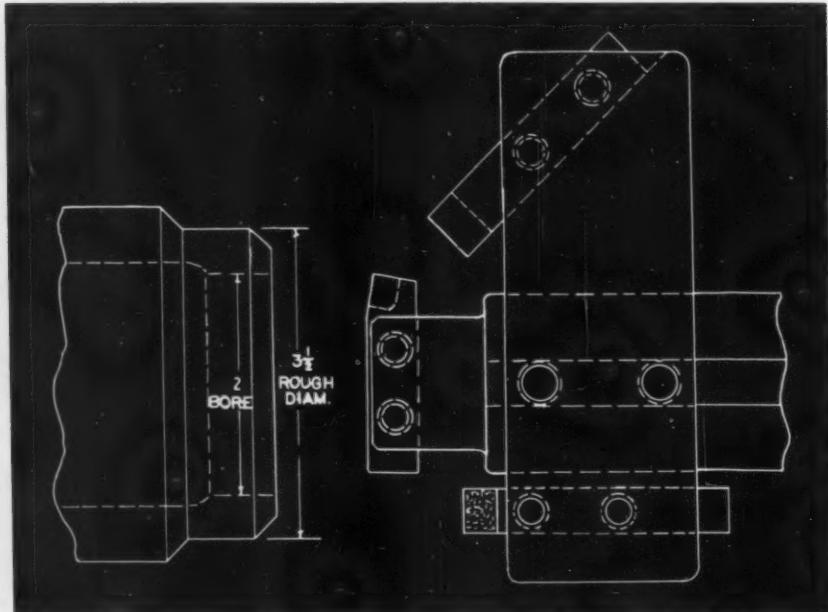
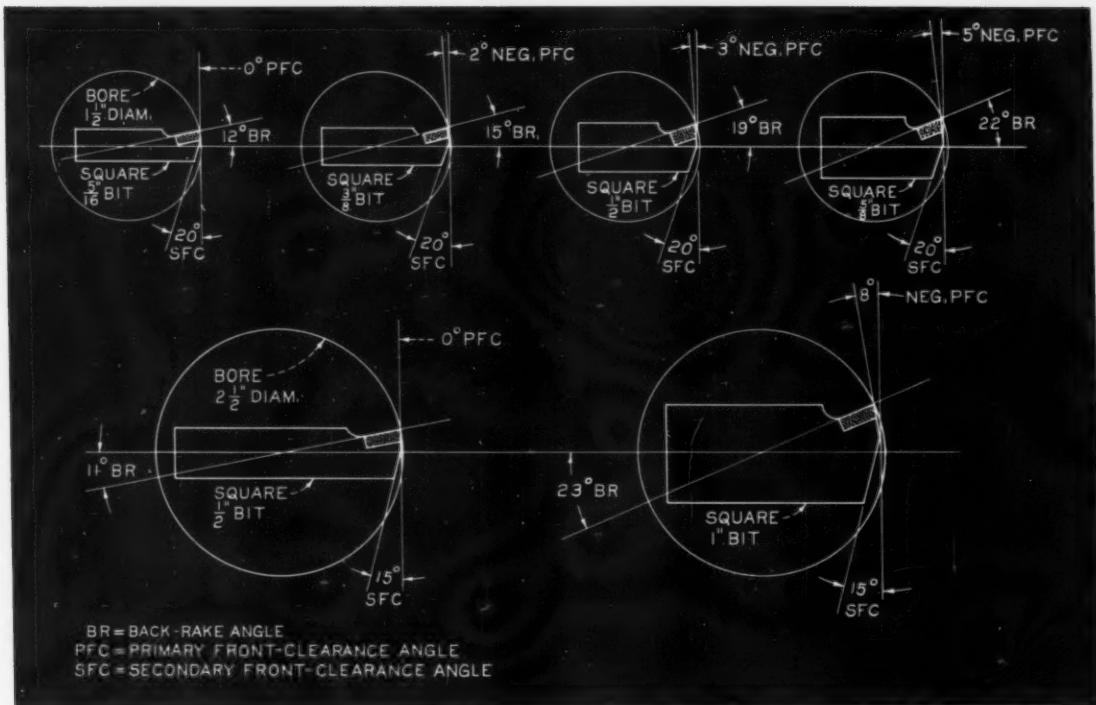


Fig. 2. Combination of standard carbide-tipped tools for boring, facing, and chamfering. Two of the tools replaced the special tool shown in Fig. 1.





**Fig. 3.** Various carbide-tipped boring tools designed to reduce tensile stresses and take advantage of the high compressive strength of the carbide.

the boring bit. This angle increases progressively from 12 degrees for a 5/16-inch square bit to 22 degrees for a 5/8-inch square bit.

If the BR angle were increased, this would be equivalent to creating a positive back rake, as on a turning tool. However, if the BR angle were decreased, the effect would be just the opposite, or similar to a negative back rake on a turning tool.

At no time should the vertical height of the primary front-clearance exceed one-half that of the boring bit, and preferably should be less. This is illustrated more clearly by the two bits seen at the bottom in Fig. 3. Often, on light finishing cuts, the primary front clearance need not extend downward more than the thickness of the carbide tip. For heavy-duty boring, however, the primary front-clearance angles should be small to provide more rigid support underneath the carbide tip.

Another machine tool company used a boring bit like the one shown at the upper right in Fig. 3. However, the back-rake angle was made approximately 26 degrees instead of 22 degrees. This tool was used in a bar held in a lathe spindle to finish-bore turret holes, and all existing production records were broken.

The accompanying table will serve as a guide in obtaining long tool life and high production from carbide boring bits.

#### Recommended Angles for Carbide-Tipped Boring Bits

| Diameter of Bore, Inches | Square Boring Bit Size, Inch | Primary Front-Clearance Angle (Negative), Degrees | Secondary Front-Clearance Angle (Positive), Degrees | Back-Rake Angle, Degrees |
|--------------------------|------------------------------|---|---|--------------------------|
| 3/4                      | 1/4                          | 4   | 25  | 20                       |
| 3/4                      | 5/16                         | 5   | 25  | 27                       |
| 1                        | 1/4                          | 0   | 15  | 15                       |
| 1                        | 5/16                         | 3   | 20  | 18                       |
| 1                        | 3/8                          | 4   | 20  | 20                       |
| 1 1/4                    | 1/4                          | 0   | 20  | 12                       |
| 1 1/4                    | 5/16                         | 0   | 20  | 14                       |
| 1 1/4                    | 3/8                          | 5   | 15  | 19                       |
| 1 1/2                    | 5/16                         | 0   | 20  | 12                       |
| 1 1/2                    | 3/8                          | 2   | 20  | 15                       |
| 1 1/2                    | 1/2                          | 3   | 20  | 19                       |
| 1 1/2                    | 5/8                          | 5   | 20  | 22                       |
| 1 3/4                    | 5/16                         | 0   | 20  | 10                       |
| 1 3/4                    | 3/8                          | 2   | 20  | 12                       |
| 1 3/4                    | 1/2                          | 4   | 20  | 17                       |
| 1 3/4                    | 5/8                          | 6   | 20  | 21                       |
| 2                        | 5/16                         | 0   | 20  | 9                        |
| 2                        | 3/8                          | 0   | 20  | 10                       |
| 2                        | 1/2                          | 3   | 20  | 14                       |
| 2 1/2                    | 1/2                          | 0   | 15  | 12                       |
| 2 1/2                    | 5/8                          | 2   | 20  | 14                       |
| 2 1/2                    | 3/4                          | 5   | 15  | 18                       |
| 3                        | 5/8                          | 2   | 15  | 12                       |
| 3                        | 3/4                          | 2   | 20  | 14                       |

# How to Mount Anti-Friction Bearings on Shafts and in Housings

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**B**ALL and roller bearing retention has become more difficult and more important in many new applications. This is particularly true in the aviation industry where the prime objectives are weight reduction and simplified design and manufacture. In addition to these factors, selection of bearing retention method is influenced by ease of installation, bearing removal provisions, and cost.

In modern machine designs, there are five basic ways to retain bearings on shafts and in housings. These methods include bolting with bolts, lock-nuts, and similar counter parts; the use of snap-rings; staking, which includes both roller staking and point staking; ring swaging; and bonding or cementing. Staking, ring swaging, and cementing are used in the aircraft industry because of the space- and weight-saving features these methods provide.

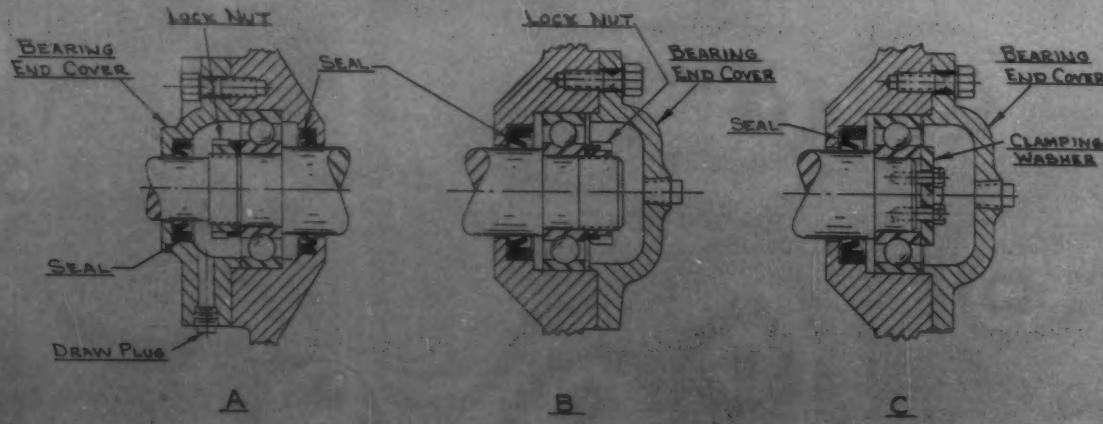
Thrust loads in all bearing mountings are either primary or secondary. A primary thrust load in bearing mounting practice is usually considered one that is continuous or imposed. In

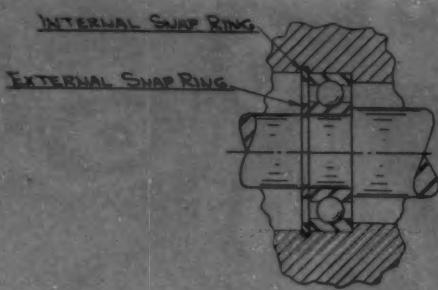
mounting a bearing for this type of load, the associated parts have to be designed for safe and continuous operation of the involved machine. Thrust loads of a relatively light or intermittent nature are considered in the same general classification—secondary.

The details of bolted bearing mounted assemblies can only be generalized, since a large number of different constructions are used. Bearings used in automobiles and general industrial machinery are commonly retained in their mounts by bolting.

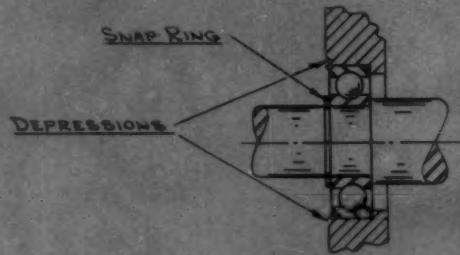
Typical horizontal ball-bearing mountings using the bolted assembly method are illustrated in Fig. 1. These mountings use lock-nuts, bearing end-covers, and clamping washers for retaining the bearings. The fixed ball bearing shown at A is retained on the shaft by a lock-nut, and in the housing by a bearing end-cover or end-cap. Unit type synthetic rubber seals complete the assembly. This is a popular type of mounting for fixed bearings when they are to be used on a horizontal shaft.

Fig. 1. Typical horizontal mountings for ball bearings utilizing bolts, lock-nut or clamping washer, and bearing end-covers for retention. The mounting at (A) is used with fixed bearings.





**Fig. 2.** Ball bearing is held both on shaft and in housing with snap-rings. The rings may or may not be re-used depending on the application of the bearing.



**Fig. 3.** Retention of bearing in housing is accomplished by point or roller staking. Special tools cause housing metal to flow over chamfered edge of outer race.

Mounting for a floating ball bearing located on the same shaft is illustrated at B. The bearing is held on the shaft with a lock-nut and in the housing, with a bearing end-cover. A sectional drawing at C shows a floating ball bearing mounted on a horizontal shaft similar to that at B. This bearing, however, is held in place by means of the clamping action of a washer bolted to the end of the shaft. The washer and the bolts accomplish the same results as the lock-nut in the mounting shown at A. Unit or lip type seals are also used in the two latter mountings to retain lubricant in the bearings and to exclude foreign matter.

The bolted assembly illustrated at A in Fig. 1 can take thrust loads in either direction, and where the differential movement or the end play of the outer ring within the housing is desirable, those at B and C rate high. Bearings in bolted assembly mountings are fairly easy to install and inspect. From the standpoints of design simplicity, weight, and cost, however, this method of retention is poor.

Snap-rings are used to retain a ball bearing on a shaft and in a housing in the manner illustrated in Fig. 2. This method of mounting rates high in ease of installation, in bearing service removal and replacement, and in adaptability to housing materials. Regarded as only fair when thrust loads, simplicity of design, and ease of inspection are considered, snap-rings rate poor for differential movement and for cost saving. Although these rings have relatively high shear strength, they are limited to designs involving light or secondary thrust loads. This is due to the clearance or end play which inevitably exists because the groove must be wider than the snap-ring to permit assembly. Clearance is increased by the accumulation of snap-ring, bearing, and groove tolerance.

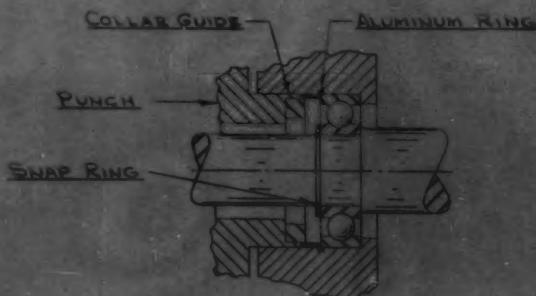
When using the snap-ring method of retention, the shaft or housing diameter, groove diameter, groove width, distance of groove from shaft end or housing surface, and snap-ring dimensions all should be closely inspected. When used in general industrial assemblies, snap-rings are often re-used after removal. In some aircraft plants, however, the re-use of snap-rings is prohibited in order to minimize the possibility of employing those that have been permanently deformed during either their original installation or removal for service operations.

Bearings are often staked in housings used in aircraft mountings. Staking has the advantages of ease of installation, simplicity of design, no added weight, ease of inspection, and low cost. Also, the method rates as fair from the standpoint of thrust loads, differential movement, bearing service removal, replacement, and adaptability to housing materials. Bearings can be staked equally well in housings of wrought or cast aluminum and magnesium. Steel housings, provided they are not hardened to an excessive degree, can also be staked. In this method, bearing housing metal is caused to flow over the outer ring or race (Fig. 3). Special tools designed and built for staking have rollers, ball points, or merely carbide projections with spherical ends. Staking has been a popular method of retaining bearings in aircraft mountings.

When a bearing is replaced, the subsequent staking operation results in less metal flow over the outer bearing ring or race chamfer. This reduces the amount of thrust the mounting can withstand.

Ball staking is done with a special tool that has a projecting ball. Dents are formed when the tool is brought in contact with the surface of the bearing housing and static pressure is applied. Such a tool is used to produce depressions

Fig. 4. Punch and collar guide are employed to force aluminum ring over the chamfer on the outer bearing ring. When swaged in this manner, bearings are not easily removed.



around the circumference of the housing bore and adjacent to the outside periphery of the bearing outer race. Spacing of the depressions can be varied to suit the size of the bearing and the operating conditions. Ball staking is limited to wrought aluminum and steel, and point staking is used primarily on steel housings for aircraft bearings.

Ring swaging is also used on aircraft bearing mountings, but where thrust loads are more or less permanent. In this method, a soft aluminum-alloy ring is forced over the bearing chamfer and into the shaft or housing bore as illustrated in Fig. 4. Retention by ring swaging is good from the standpoints of ability to take thrust loads, differential movement; fair from the standpoints of simplicity of design and ease of inspection; and poor from the standpoints of ease of installation, weight, and cost.

Positive contact is assured between the aluminum ring and the bearing, and the ring and the shaft or housing. This eliminates end play. However, the method has three inherent disadvantages. The aluminum ring is difficult to remove and a new one is required for each replacement. There is also a danger of cracking the housing when forcing the ring into the groove behind the bearing.

Another method of retaining bearings sometimes used in the aircraft industry is that of cementing or bonding. Cold thermosetting ce-

ment is applied to the outside diameter of the bearing before inserting it into a housing such as shown in Fig. 5.

The entire bearing assembly is then cured at room temperature for six days. This method is reliable and efficient, provided quality control is exercised during manufacture and installation. Also the contacting surfaces of the bearing and housing should be chemically clean to insure a good bond.

While good in weight saving and adaptability to housing material, cementing rates only fair when thrust loads, simplicity of design, and cost are considered. Also the method is poor in ease of installation, ease of inspection, and bearing service removal and replacement. Cementing is applicable to all wrought or cast aluminum, steel, and magnesium alloys.

The bearing retention methods here illustrated and described do not cover all that are used in industrial and aircraft assemblies but they are the ones most commonly used. Choice of the best method of retention for a given application depends to a large degree upon the equipment in which the bearing is used and the conditions of operation. A method used successfully in one machine may be a dismal failure in another. For this reason, the design engineer must use as much care and discretion in selecting bearing retention methods as he does in choosing the bearings themselves.

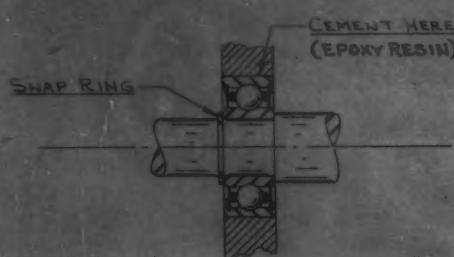
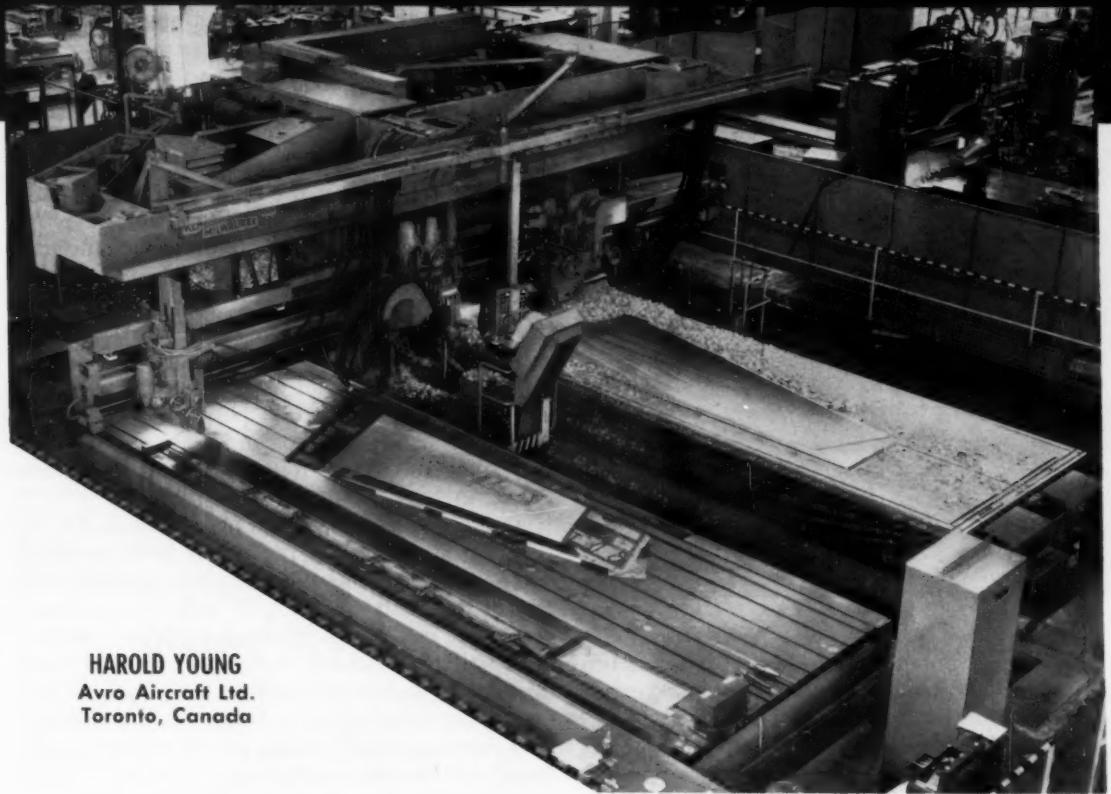


Fig. 5. Cold thermosetting plastic cement can be used to bond a bearing to its housing. A period of several days is required to completely cure the cement.

# Skin Milling at 100 Inches per Minute



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**Versatile, gantry type skin mill at Avro Aircraft speeds output of integrally stiffened skins and completely machined structural members. While this machine is tracer-controlled at present, it can be converted to tape control.**

INTEGRALLY stiffened skins and completely machined structural members are becoming increasingly necessary in planes designed for supersonic operation because such parts are much stronger and smoother than fabricated structures. In tooling up for the production of the supersonic CF-105 "Arrow" plane, Avro Aircraft purchased a 200-ton skin-milling machine to make these parts.

This gantry type skin mill, made by the Kearney & Trecker Corporation, Milwaukee, Wis., is extremely versatile. Equipped with a 360-degree horizontal tracer control, as well as a rise-and-fall rail for vertical movements, the machine is used to make prototype skins and for production runs on both straight and convergent, integral-rib members. Total rise-and-fall movement of the machine beam is 36 inches.

Most skins are currently being machined from solid billets of 75S-T6 aluminum alloy, or rolled plate of the same material, that is stretcher stress-relieved, imparting a 2 per cent permanent set to minimize distortion during machining. However, the machine is amply powered (50/100-hp motors on both heads) to permit possible future cutting of steel.

A working surface 9 feet wide by 28 feet long is provided on the skin mill table, seen at the right in the heading illustration. Alongside the work-table, at the left, is a separate table on which the templates are placed. Meehanite castings with steel inserts are used for the rise-and-fall templates, while aluminum and steel are employed for 360-degree tracer masters.

Both tables are stationary while the beam carrying the tracer and cutter-heads moves over

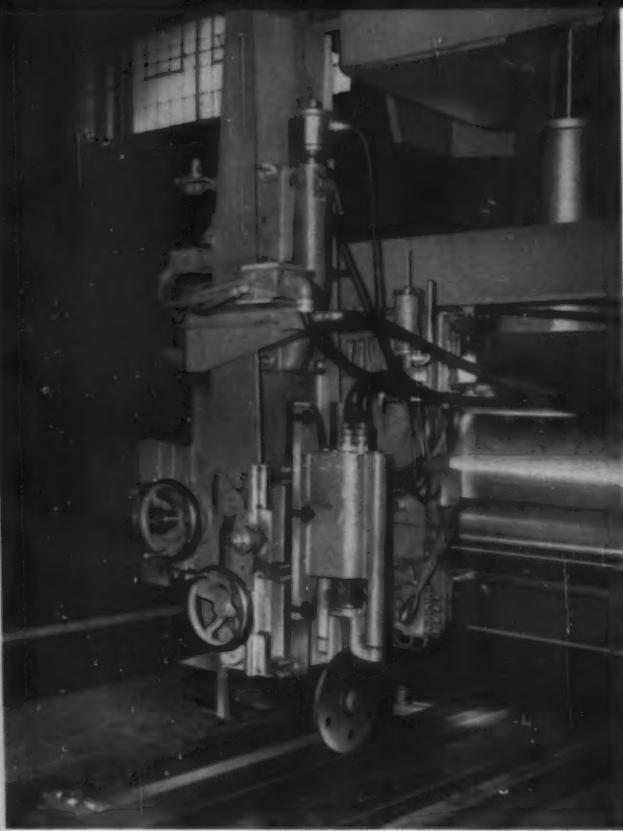


Fig. 1. Tracer unit on the skin mill seen in the heading illustration is mounted on an extension of the machine beam and operates under only 8 ounces of pressure.

ing the spindle in two directions. Both heads are dual speed, capable of delivering 50 hp at 1800 rpm and 100 hp at 3600 rpm.

Mounted on an extension of the machine beam is the tracer unit, Fig. 1. The stylus, under 8 ounces of pressure, is guided by the operator along the contours of the templates. Movements are electronically transmitted to the traveling head and cutter of the skin mill. A mechanism is provided for indexing the horizontal cutter across the beam while the stylus is being indexed simultaneously over the template table in a direct ratio. This is accomplished automatically, so that upon the completion of one cut, both the cutter and stylus are moved into position for the next cut. The tooling bar for indexing is equipped with pins to permit repetitive location within 0.0002 inch.

At present, the horizontal milling head, Fig. 2, is used for the greater portion of metal removal on each panel. The basic, infinitely variable feed rate of the gantry beam is 30 inches per minute. However, on straight-through, channel section cuts, with rise-and-fall tracer control, feed rates up to 100 inches per minute are possible. For conventional milling cuts, longitudinal and cross-feed rates up to 100 inches per minute are used. Rapid traverse for positioning can be carried out at 240 inches per minute in either direction.

In producing a typical skin panel, a 3200-pound aluminum plate (5 feet wide by 20 feet long and 2 inches thick) is reduced to a 290-pound finished part (having an average thickness of only 0.140 inch) in sixteen hours, floor-

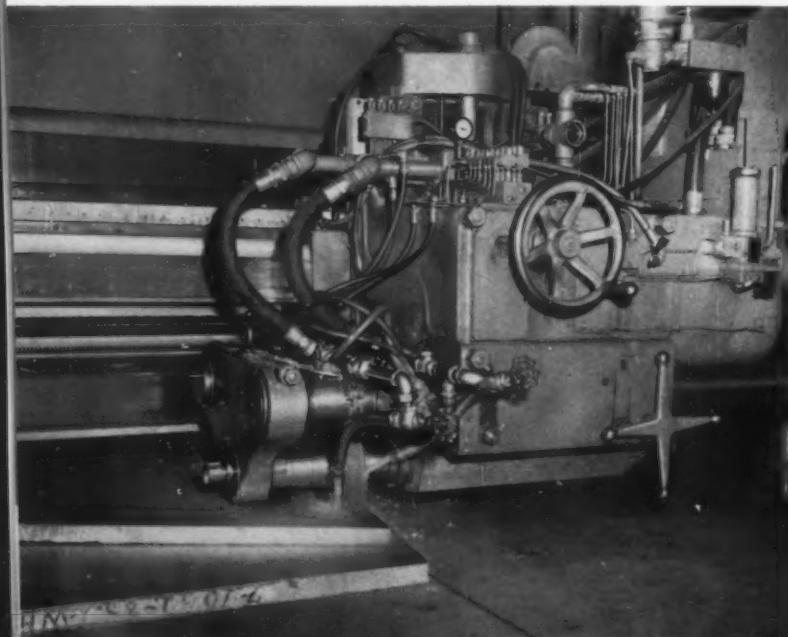


Fig. 2. Horizontal head of skin mill equipped with 14-inch diameter cutter having inserted, carbide-tipped teeth. Cutters rotate at 1800 rpm with 50 hp and at 3600 rpm with 100 hp.

to-floor time. Actual cutting time to mill out more than 90 per cent of the original weight in chips is only about three and one-half hours. To keep the machine from burying itself in chips, screw type conveyors are provided along both sides of the work-table to feed the chips into a chip conveyor belt running the length of the milling shop. This belt, serving several machines, feeds into mobile scrap bins. Mist coolant is applied to the cutter during light cuts, and a flood system providing 75 gallons of coolant per minute is used for heavier cuts.

Some idea of the speed with which metal is removed on this machine can be gained from one example of a horizontal milling cut. The width of cut is 2 1/2 inches; depth of cut, 1 1/2 inches; speed of the 14-inch diameter cutter, 3600 rpm; and feed rate, 100 inches per minute. This results in a metal-removal rate of 375 cubic

inches per minute. Small end-mills are made from high-speed steel while the larger cutters are of the carbide insert type with a 20-degree helix angle.

An unusual design feature of the machine is the use of easily replaceable, stainless-steel strip ways that ride in plastic inserts on the beds and gantry shoes. To replace the ways, it is only necessary to jack up the gantry, pull the slipper pads, and slip in the hardened, stainless-steel strip.

Automatic safety devices on the skin mill include an arrangement for stopping and retracting the cutters if the vacuum holding the work on the table drops below a pre-set amount. Also, the cutter will retract and stop if it begins to overheat. The machine is so designed that it can be converted to General Electric numerical tape control which would make the tracer and templates unnecessary.

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## **Productivity of Engineers Stressed in Survey**

A survey, conducted at the annual meeting of the American Society of Mechanical Engineers in New York last November and recently tabulated, indicates that the majority of the engineers who responded think that industry should put more emphasis on increasing the productivity of engineers already employed. This would be in addition to continuing efforts to increase the number of students graduated by engineering colleges each year.

In response to the question, "What measures do you think should be taken to end the shortage?" 65 per cent of the answers suggested changes in current industrial practices. In the order of frequency these steps dealt with:

1. Providing engineers employed in industry with more technical assistants and clerical help, thereby freeing professional men for more creative work—31 per cent.
2. Increasing salaries to make the profession more attractive to youngsters and to qualified engineers who have been lured to other fields by higher pay—21 per cent.
3. Improving the recognition and prestige accorded to engineers for their contributions to the economy—12.5 per cent.

Tabulations were based on a total of 880 men who said that they hold a degree in engineering. An additional 130 who did not claim an engineering degree were tabulated separately.

## **Electronic Thickness Gage for Paint and Metal Coatings**

A quality control instrument that can measure as little as one ten-thousandth of an inch of paint film, electroplating, or metal overlay has been developed by General Motors research staff. The new device, called Laminagage, is used for non-destructive and high-rate testing of production items. No special training is needed to operate the instrument. In addition, it is portable and can be plugged into any 110-volt outlet.

The Laminagage consists of a small metal cabinet containing electronic equipment and a probing coil connected by a coaxial cable. When the probing coil is brought into contact with the part under test—such as a bearing, a rod, or a piston pin—the thickness of the paint film or plating overlay on the part instantly registers on a dial.

Utilizing the principle that the distribution of an alternating electric current in a conducting material decreases as it penetrates the surface and that the rate at which the current decreases depends partially on the frequency of the alternating current, the Laminagage sweeps through a fixed range of frequencies and locates the frequency at which the magnitude of the current reaches a fixed value. This frequency is related to the thickness of the copper layer. The instrument has been used successfully to measure thickness of paint on aluminum, nickel electroplate on steel, copper electroplate on steel, and babbitt bearing overlay on bronze.

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## Tables Simplify Calculation of Gear-Testing Center Distances

THE practice of inspecting gears by rolling them in tight mesh with a master gear has been in use for many years. As the demand for greater accuracy increases, the value of this test is becoming more widely recognized. The method is sound in principle and easy to use, but there is still some misconception about the tolerances necessary for master gears.

Tooth spacing, concentricity, and involute profile should be held to the closest tolerances practicable. It is not so important, however, to control size to the same degree of accuracy. Flexibility of the involute system permits a center-distance variation without affecting the precision of the test. Objections to a deviation from the nominal dimensions of a master gear arise only when it is used to determine or check the size of the product. There appear to be two main objections in such cases: one by those to whom the word master not only implies but must mean perfection, and the other by those who find present methods of calculating center distance from arc tooth thicknesses involved and time consuming.

Requirements for accuracy have become more and more exacting, and as a result the tolerances on tooth spacing, concentricity, and profile have been reduced to a minimum. When exact size is also specified, the toolmaker's problem of meeting all these close tolerances concurrently becomes an almost impossible one.

Nevertheless, a reasonable tolerance on master gear size, coupled with proper design, obviates

this difficulty to a great extent and in no way affects the result of the final inspection. This leaves only the problem of calculating (from specified arc tooth thicknesses of both master and work) the correct center distance at which to set the inspection instrument when checking the size of production gears. In the heading illustration, an inspector is setting the center distance on a Fellows fine-pitch gear-checking machine.

A simple method for computing this testing center distance has been developed by the Fellows Gear Shaper Co., Springfield, Vt. From formulas based on fundamental relationships, the difference between the involute functions of the nominal pressure angle and the active pressure angle is first calculated. Then, the numerical value for the ratio of the cosine of the nominal pressure angle to the cosine of the pressure angle at meshing position is found by referring to a table. The proper center distance at which to check the size of production gears is equal to this ratio multiplied by the nominal center distance.

The difference  $d$  between the involute functions of the nominal pressure angle and the active pressure angle can be readily calculated by dividing the difference  $D$  between the sum of the given arc tooth thicknesses and the circular pitch by twice the nominal center distance. To find the nominal center distance  $C$ , the sum of the number of teeth  $N_w$  in the work gear and the number of teeth  $N_M$  in the master gear is divided by two times the diametral pitch  $P$ . These relations, ex-

pressed as formulas, are

$$C = \frac{N_w + N_m}{2P}$$

and

$$d = \frac{D}{2C}$$

A set of tables covering involute function differences and corresponding cosine ratios for pressure angles from 13 degrees to 24 degrees by 0.1-degree increments has been compiled and is available on request to the company. The accompanying table is for pressure angles of 14 1/2 and 20 degrees. In each case, the first column is a tabulation of involute function differences and the second, the corresponding cosine ratios.

It will be noted that the values in the lower part of the first column are preceded by minus signs. This section of the table is to be used if the testing center distance is *greater* than the nominal center distance. The upper section is used if the testing center distance is *less* than the nominal center distance.

When checking *external* gears, if the arc tooth thickness of the master gear plus the arc tooth

**Table of Involute Function Differences  $d$  and Cosine Ratios for Gears Having Pressure Angles of 14 1/2 and 20 Degrees**

| 14 1/2 Degrees                   |              | 20 Degrees                       |              |
|----------------------------------|--------------|----------------------------------|--------------|
| Involute Function Difference $d$ | Cosine Ratio | Involute Function Difference $d$ | Cosine Ratio |
| 0.0015694                        | 0.993614     | 0.0031949                        | 0.990899     |
| 0.0014757                        | 0.994016     | 0.0029984                        | 0.991479     |
| 0.0013804                        | 0.994421     | 0.0027996                        | 0.992063     |
| 0.0012836                        | 0.994830     | 0.0025985                        | 0.992651     |
| 0.0011854                        | 0.995242     | 0.0023951                        | 0.993243     |
| 0.0010855                        | 0.995658     | 0.0021893                        | 0.993838     |
| 0.0009842                        | 0.996077     | 0.0019812                        | 0.994437     |
| 0.0008812                        | 0.996499     | 0.0017707                        | 0.995040     |
| 0.0007767                        | 0.996925     | 0.0015579                        | 0.995647     |
| 0.0006706                        | 0.997354     | 0.0013427                        | 0.996257     |
| 0.0005629                        | 0.997786     | 0.0011250                        | 0.996872     |
| 0.0004536                        | 0.998222     | 0.0009049                        | 0.997490     |
| 0.0003427                        | 0.998661     | 0.0006824                        | 0.998111     |
| 0.0002301                        | 0.999104     | 0.0004574                        | 0.998737     |
| 0.0001159                        | 0.999550     | 0.0002300                        | 0.999367     |
| 0.0000000                        | 1.000000     | 0.0000000                        | 1.000000     |
| -0.0001176                       | 1.000453     | -0.0002324                       | 1.000637     |
| -0.0002368                       | 1.000910     | -0.0004674                       | 1.001278     |
| -0.0003578                       | 1.001370     | -0.0007050                       | 1.001923     |
| -0.0004805                       | 1.001833     | -0.0009451                       | 1.002572     |
| -0.0006049                       | 1.002300     | -0.0011877                       | 1.003225     |
| -0.0007311                       | 1.002771     | -0.0014330                       | 1.003881     |
| -0.0008591                       | 1.003245     | -0.0016809                       | 1.004542     |
| -0.0009888                       | 1.003722     | -0.0019314                       | 1.005206     |
| -0.0011203                       | 1.004203     | -0.0021846                       | 1.005874     |
| -0.0012536                       | 1.004688     | -0.0024404                       | 1.006547     |
| -0.0013888                       | 1.005176     | -0.0026989                       | 1.007223     |
| -0.0015258                       | 1.005667     | -0.0029602                       | 1.007904     |
| -0.0016646                       | 1.006162     | -0.0032341                       | 1.008588     |
| -0.0018053                       | 1.006661     | -0.0034908                       | 1.009276     |

thickness of the gear to be tested is less than the circular pitch, the testing center distance will be *less* than the nominal center distance and the upper portion of the table should be used. With *internal* production gears, however, if the sum of the arc tooth thicknesses is less than the circular pitch, the testing center distance will be *greater* than the nominal center distance and the lower portion of the table should be used.

The use of the tables is demonstrated by this example: Find the maximum and minimum testing center distances for a seventy-tooth, 100-pitch gear with a 20-degree pressure angle and having an arc tooth thickness of 0.0144 to 0.0154 inch. A thirty-tooth master gear with an arc tooth thickness of 0.0157 inch is to be used.

$$C = \frac{70 + 30}{2 \times 100} = 0.5000 \text{ inch}$$

$$\text{Circular pitch} = \frac{3.1416}{100} = 0.031416 \text{ inch}$$

Addition of arc tooth thicknesses:

$$0.0157 + 0.0144 = 0.0301 \text{ inch}$$

for the minimum center distance, and

$$0.0157 + 0.0154 = 0.0311 \text{ inch}$$

for the maximum center distance.

The circular pitch minus the sum of the arc tooth thicknesses all divided by two times the nominal center distance equals the value to be found in the first column of the table.

$$\frac{0.031416 - 0.0301}{2 \times 0.500} = 0.001316$$

for the minimum center distance, and

$$\frac{0.031416 - 0.0311}{2 \times 0.500} = 0.000316$$

for the maximum center distance.

Since the sum of the arc tooth thicknesses is less than the circular pitch, the gears will mesh on a center distance less than the nominal, and the upper portion of the table will be used.

By referring to the table for a 20-degree pressure angle, it will be noted that there is a value of 0.0013427 in the first column and the corresponding cosine ratio in the second column is 0.996257. This cosine ratio multiplied by the nominal center distance of 0.500 inch equals 0.49813 inch, which is the minimum center distance for testing if the table is not interpolated. Interpolation results in a cosine ratio of 0.996362 and a minimum testing center distance of 0.49818 inch.

For the maximum testing center distance, the nearest value in the first column is 0.000230 and the cosine ratio is 0.999367 which gives a center distance of 0.49968 inch. Interpolation of the table results in a difference of only 0.00012 inch.

# Carbide-Tipped Tools Speed Drilling of Gun-Barrels

Production increases of up to 200 per cent have been attained by means of improved gun-drilling techniques. By using carbide-tipped tools, high-pressure coolant, faster feeds and speeds, and increased horsepower, it has been possible to maintain closer tolerances and produce smoother finishes with longer tool life, less scrap, and reduced manufacturing costs.

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O. F. Mossberg & Sons, Inc.  
New Haven, Conn.

**G**UN-DRILLING techniques have undergone considerable improvement since they were first developed for cutting deep holes in gun and rifle barrels. Originally, drill tips were simply made with a single cutting edge and provided with suitable guiding surfaces to cut deep, straight holes. Then, the addition of a hollow



drill shank for the supply of cutting fluid under sufficient pressure to flush out the chips made it possible to drill a deep hole without periodically backing out the tool to remove the chips.

With the introduction of carbide cutting tips, a tremendous increase in cutting speeds and feeds was possible. Another major change has been the introduction of tool rotation. Early gun drills were always non-rotating and fed into a rotating work-piece. By the addition of a rotary, fluid-transfer gland to supply coolant to the rotating drill, it was found that parts of practically any size or shape could be drilled on a wide variety of standard production machines having sufficient power.

Such advancements in drilling methods led to the process being applied to numerous other jobs in aircraft, automotive, farm equipment, machine tool, and other metalworking industries. Gun-drilling techniques are no longer confined to deep holes. In many instances, the tools are used for shallow holes because the accuracy



Fig. 1. (Above) Setup on a dual-spindle horizontal machine for drilling two gun-barrels simultaneously. Machine is equipped with a 7 1/2-hp motor.

Fig. 2. (Left) Gun drills consist of a carbide cutting tip soldered to a tubular fluted shank and a driver that is held in the spindle or a stationary holder.

of location, maintained straighteners and smooth surfaces have reduced the need for secondary sizing operations.

Gun-drilling is also still being used by its originators—the manufacturers of firearms. The only differences are that it is being used for other parts—such as different firing mechanism components—as well as gun-barrels and with tremendous increase in production. Also, closer tolerances are being maintained, less scrap produced, longer tool life obtained, and manufacturing costs reduced.

At O. F. Mossberg & Sons—a major firearms manufacturer—shotgun barrels, receivers, and bolts are drilled on a Pratt & Whitney two-spindle, horizontal drilling machine, Fig. 1. This machine has been completely reworked to improve the accuracy, and the power was increased by substituting a 7 1/2-hp motor for the original 1-hp unit supplied with the machine. With these changes and the use of carbide-tipped gun drills made by the Eldorado Tool & Mfg. Corporation, production increases of approximately 100 per cent on 7/8-inch diameter holes and up to 200 per cent on 3/8-inch diameter holes have been obtained.

Savings in tool costs have amounted to more than twice the investment in new tools. Also, scrap parts produced now are considerably less than 1 per cent, and the need for straightening of the gun-barrels has been reduced to a minimum. With previous drilling methods on under-powered equipment, the tool could only be fed at the rate of 2 to 2 1/2 inches per minute into the gun-barrel. Now, a feed rate of 6 inches per minute or more is used. Surface speeds have been

increased from 200 to 550 feet per minute, and smoother surfaces are obtained—a finish of 32 micro-inches being produced consistently.

Typical gun drills used for these operations are shown in Fig. 2. The drills consist of a carbide cutting tip soldered to a tubular fluted shank and a driver. Tips of the single-flute tools are shaped to cut on only one side of the hole. A wear surface for supporting the cutting edge rides on the wall of the hole behind the cutting edge or in a very accurately sized bushing to start the hole. A thin film of cutting oil separates the wear surface from the work or bushing to prevent rubbing and galling. The entire drill is slightly tapered about 0.0006 inch per inch to reduce rubbing in the hole. An oil-hole passes through the tip to permit coolant to be delivered to the cutting edge.

A bushing is provided for starting the drill into the work-piece. The bushing bores are made about 0.0002 inch larger than the drill diameters and are discarded when they wear beyond 0.0005 inch over size.

Sulphurized fatty oil of light viscosity is used as the cutting fluid at Mossberg. While the coolant is currently being supplied to the drills under a pressure of about 300 psi, research tests have proved that increased pressure will improve drill performance. Also, maintaining the oil at an even temperature, which is not done at present, will permit holding closer tolerances. Filtering, or the use of centrifugal or magnetic separators, is essential to remove fine particles before recirculating the oil.

With previous methods of gun-drilling, the tools had to be resharpened after cutting only

Fig. 3. Close-up view of gun drill about to enter box for collecting chips produced during the operation.

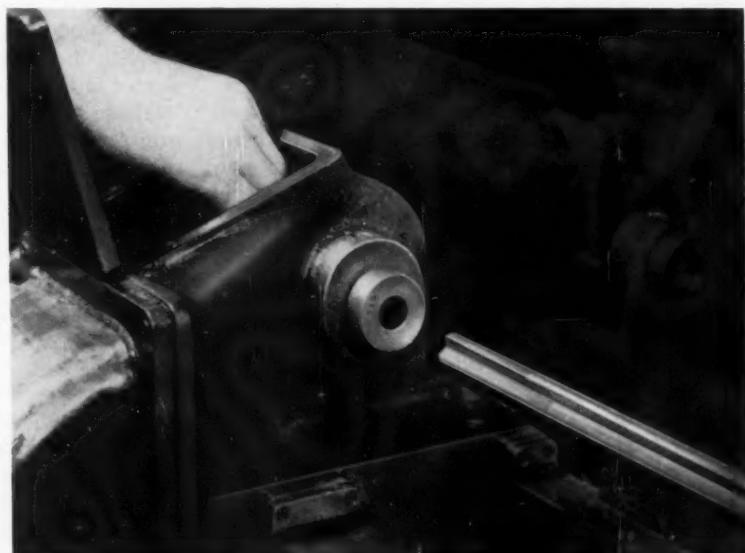




Fig. 4. Group of rifle barrels that have been drilled are ready for secondary operations and assembly.

six to eight gun-barrels. Now, 150 work-pieces or more can be completed before sharpening is necessary. Gun drills are sharpened with a 220-grit diamond wheel, using an adjustable-angle fixture to carefully control the drill angles.

Gun drills can usually be resharpened several times before a complete regrinding of the nose is necessary. In many cases, only the outer angle of the drill tip has to be touched up by grinding off a few thousandths of an inch. If too much material has to be ground from the outer angle surface, the location of the point of the tool would be transferred beyond the established tolerance. Then it becomes necessary to grind the inner angle and the oil clearances.

The determining factor for resharpening is the width of the wear-land, and the amount of material to be ground off depends on the damage to be removed at the outer corner of the outer angle. Gun drills can be resharpened until there is practically no carbide left.

## Fatigue Testing Machine for Spring Wire

A recently constructed machine for fatigue-testing small-diameter wire is proving very useful in studies of spring materials at the National Bureau of Standards. Developed by J. A. Bennett and H. C. Burnett of the Bureau's mechanical metallurgy laboratory, the machine stresses the straight wire sample in reversed torsion, simulating the stresses in a coiled spring under fluctuating tension or compression load. Results obtained with straight wire in this way show good correlation with the results of fatigue tests on compression springs coiled from similar wire.

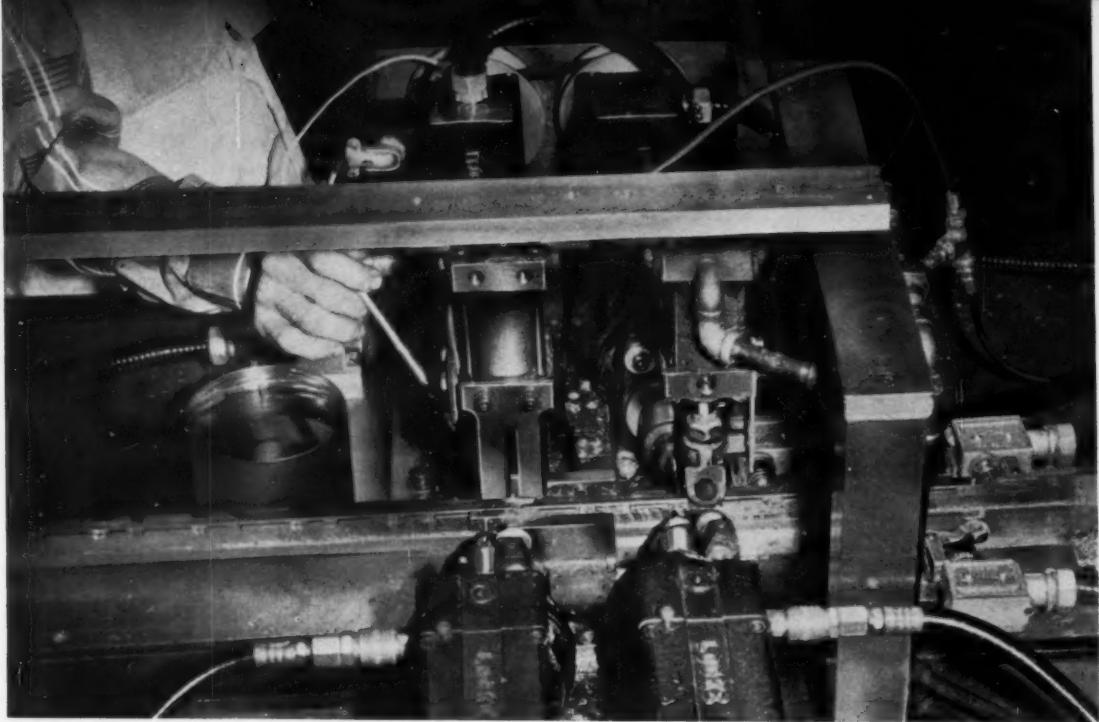
The machine consists essentially of two aligned grip heads that hold the wire specimen while they oscillate individually through an angle of about 120 degrees. The amplitude of deflection in the specimen is set by means of an adjustable coupling that shifts the phase relation between the oscillating grips. The torsional strain for various settings of the adjustable coupling is determined by means of a clip-on dial-and-pointer combination. The number of oscillations at failure is then given by a counter which is driven through a reducing gear assembly attached directly to the motor shaft.

## Iron Powder Industry Continues Rapid Growth

Iron powder usage continued its phenomenal growth in 1956, according to statistics compiled by the Metal Powder Association. An all-time high of 32,500 tons of iron powder was shipped during that year. Comparing this to the 2000 tons shipped in 1946 gives evidence of the rapid growth of the American powder metallurgy industry in a single decade.

These statistics are based on reports from all iron powder producers and importers, including shipments of domestic and Canadian iron powder as well as imported powders. They cover powders made by hydrogen reduction of iron ores or mill scale, electrolytic deposition, reduction of iron carbonyl, direct chemical reduction of ore, and atomization of molten metal.

During 1956 about 14,000 tons of iron powder went into the manufacture of structural parts such as cams, gears, and other machined parts; about 145 tons went into metallic friction materials such as brake linings and clutch facings; about 1000 tons were used for electronic and magnetic applications; with the balance going into coated electrodes for welding, and also into pharmaceuticals and chemical catalysts.



# Wise Machine Design Speeds SAGE Project

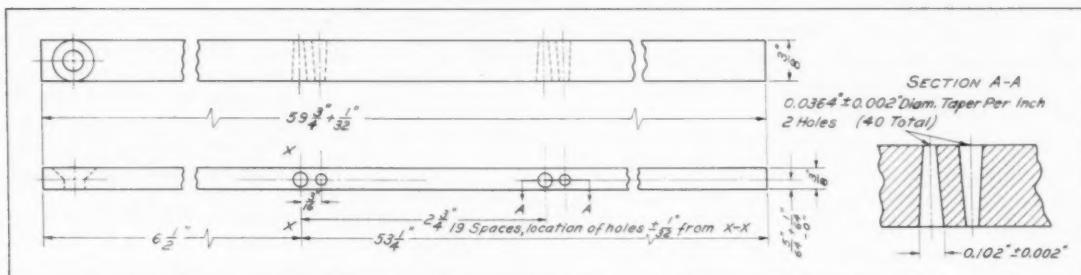
**HYMAN LACOFF, President**  
**Mechanical Development Corporation, Flushing, N. Y.**  
and  
**SHERWOOD B. MENKES**  
**Assistant Professor of Mechanical Engineering**  
**The City College of New York**

**F**OUR small air spindles and a work-indexing slide are the heart of a custom-made machine tool doing a precision drilling and reaming job on hard copper bus-bars. These bars are rectangular in cross-section, 3/8 by 3/16 inch, and approximately 5 feet long. They are components of computers being manufactured at the Kingston,

N. Y., plant of the International Business Machines Corporation for the United States Air Force's SAGE (Semi-Automatic Ground Environment) project, an air warning and defense system.

A drawing of one of the bars appears in Fig. 1. The operations performed on the machine con-

**Fig. 1.** This work-piece requires drilling and taper-reaming of a series of small holes. In each pair of holes the tapers run in opposite directions.



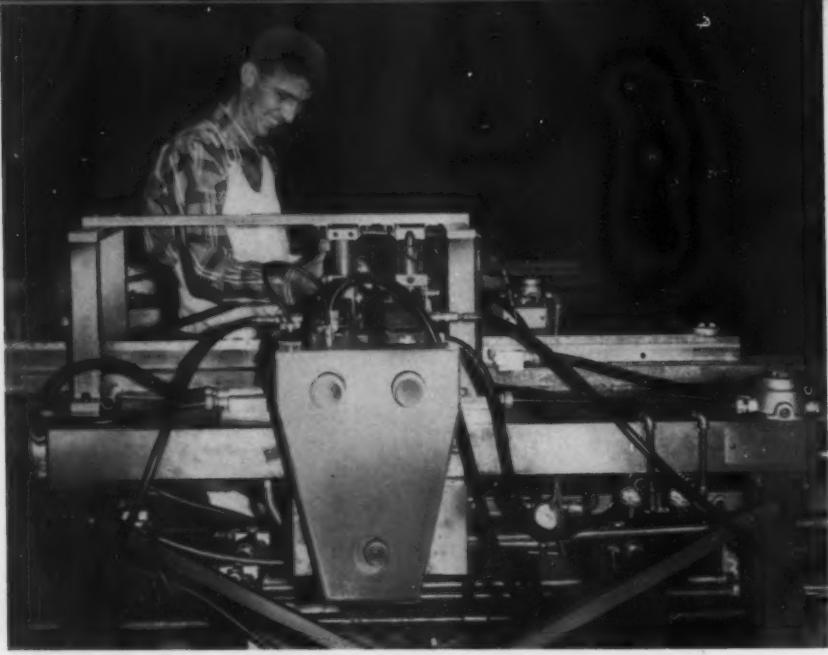


Fig. 2. The equipment is built around commercially available components. Two vertical cylinders in front of the operator actuate clamping rollers.

sist of drilling and taper-reaming forty holes which serve as sockets for solderless terminals. Holes are grouped in pairs, tapering in opposite directions in each pair. Center distances are  $3/16$  inch within each pair, and  $2 \frac{3}{4}$  inches between pairs. Since friction is depended on to maintain contact with the terminals, hole size and taper are fairly close, as can be seen from the specifications on the enlarged section A-A of the drawing.

The Mechanical Development Corporation, Flushing, N. Y., designed and assembled the special equipment involved (Fig. 2) and has been

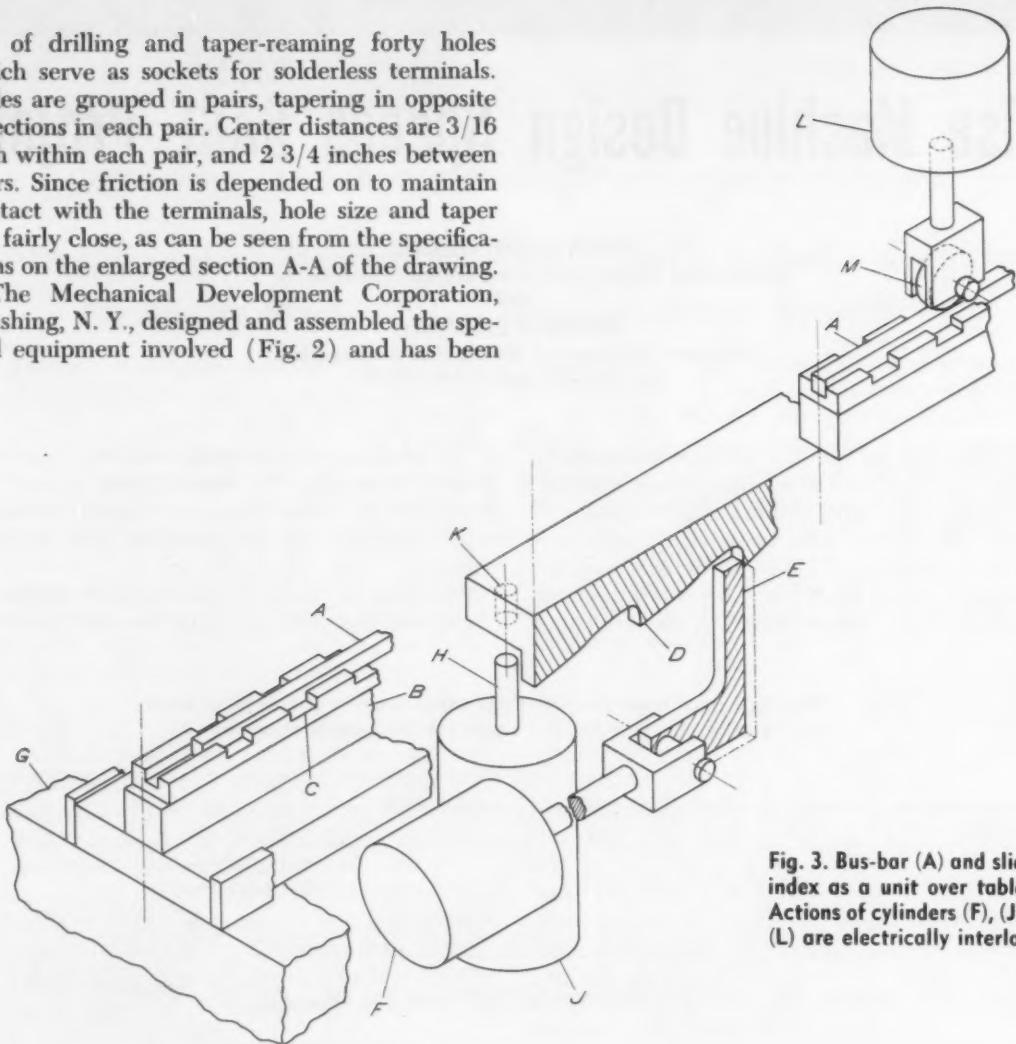
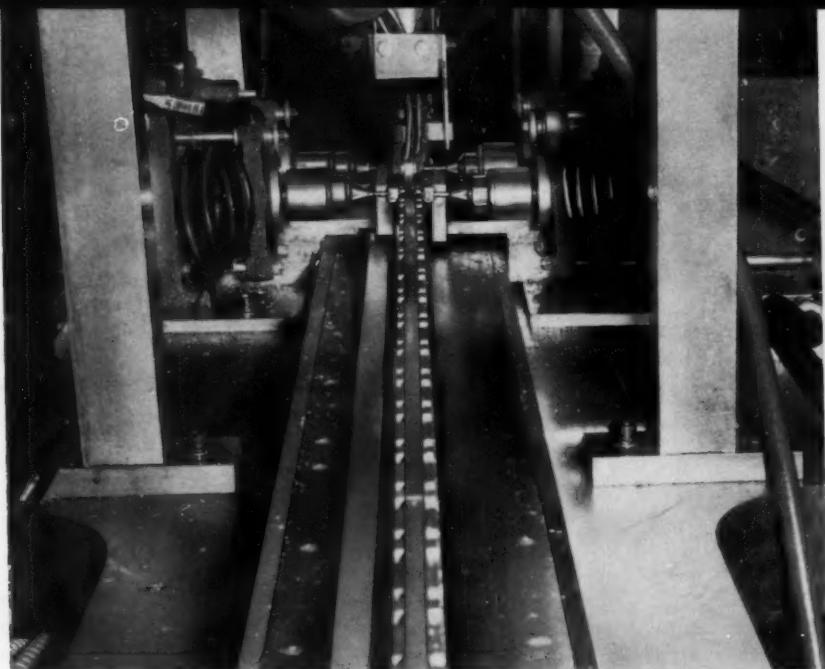


Fig. 3. Bus-bar (A) and slide (B) index as a unit over table (G). Actions of cylinders (F), (J), and (L) are electrically interlocked.

**Fig. 4.** The slide near the extreme end of its travel. It has just been loaded with a bus-bar and is seen here as it indexes to the two drilling stations.



supplying the bus-bars at low unit cost. These features are significant: no bulky jig required; no loading between drilling and reaming; simultaneous operation on four holes; automatic cycling and indexing; close control of reamed hole; automatic drill retractions; and use of standard control components.

Since the reamers have to operate from both sides of the work because of the opposing directions of taper, the air spindles are arranged horizontally, as can be seen in the heading illustration. There are two spindles on each side of the machine center line. The work indexes from left to right, with the first spindle on each side drilling the hole.

Simultaneously, the other two spindles, positioned 2 3/4 inches away, taper-ream the holes drilled in the previous index. An important advantage of this spindle arrangement is that holes are drilled in the same direction in which they later are reamed. This prolongs reamer life, since it keeps the reamer from initial contact with the burr that remains where the drill emerges from the metal.

Air spindles are standard Bellows-Locke units. Each drill-reamer combination is belt-driven from a common 1/2 hp. motor; the drill at 2900 rpm, and the reamer at 1800 rpm. Timers in the electrical circuit make the drills retract automatically at intervals during the feed stroke for chip clearance necessary because the hole length is four times its diameter. Other timers produce a momentary dwell of the reamers when they are fully advanced to size the hole accurately.

Provisions for supporting, indexing, and clamping the work are explained by the isometric drawing, Fig. 3. Bus-bar A is nested in slide B, the visible portion of which is an inverted T

shape in cross-section. Milled areas C register with the drilling and reaming positions, giving the tools access to the work surfaces.

The slide is formed along its bottom into ratchet teeth D having a pitch of 2 3/4 inches. In each index, pawl E, driven by air cylinder F, advances the slide one pitch distance over machine table G. Immediately, positive positioning pin H, driven by air cylinder J, rises and engages one of a series of detent holes K drilled on 2 3/4-inch centers in the slide bottom.

Once the pin is in the appropriate hole, air cylinder L forces roller M down, securing the bus-bar in the slide for the machining. (Actually, there are two of these clamping devices, one between the drilling spindles and one between the reaming spindles, as can be seen in the heading illustration.) Upon completion of the drilling and reaming, the air spindles retract, clamping pressure is released, the pin drops out of its detent hole, and air cylinder F again advances the slide one pitch distance. All of these movements are performed automatically.

An elaborate interlocking control circuit is superimposed on the entire structure. This circuit prevents the work from indexing until both drilling and reaming are completed and the spindles are retracted. Two essential subsidiary control patterns are also provided. One of these prevents the reamer spindles from operating when the first pair of holes in the bus-bar is being drilled, since there are no holes to be reamed. The other pattern eliminates the operation of the drill spindles when the final pair of holes is being reamed.

Another view of the machine, Fig. 4, shows the work and slide approaching the drilling stations. Jigs fixed at the stations keep the twist drills from deflecting.

# Washing-Machine Tubs Slip-Coated Automatically

Labor on washing-machine tub dipping is reduced by 60 per cent and a coating of uniform thickness obtained by mechanically rotating tubs slowly on a spider and jarring them intermittently to remove excess slip.

JOHN H. BAUER, Manufacturing Engineer  
Clyde Division, Whirlpool-Seeger Corporation  
Clyde, Ohio

UBS for Sears-Kenmore and RCA Whirlpool home laundry washing machines are major production items at Whirlpool-Seeger Corporation, Clyde, Ohio. These tubs are fabricated from sheet steel and then washed, pickled, and coated with a high grade of vitreous enamel, inside and outside.

As a first step in the enameling process, a ground coat of slip must be applied smoothly and uniformly. This slip consists of finely ground silicious material suspended in water. Although this coating is applied by dipping, it is important that runs and sags be avoided.

For many years, dipping was done by hand, a tiring procedure that not only required skill but was also difficult to control. Subsequent to hand-dipping, the tubs were hung from an overhead chain and turned by hand to avoid runs and sags. Unless extreme care was exercised, undesirable marks were left by this handling.

To expedite processing, reduce labor, and at the same time improve the quality of the ground coat, the mechanical setup here illustrated has been installed and is in successful use. Each tub

is first loaded on a special spider-like carrier, shown in Fig. 1, and is advanced around a loop track. A portion of the carrier projects through a central hole in the bottom of the tub and is expanded to grip the work at the hole. This action is initiated by a cam on the track. Also, conical points are brought to bear on the under side of the tub bottom where minor marks in the finish can be tolerated.

Further along the track, the gear at the inner end of the carrier engages a rack and begins to rotate the tub slowly. This motion continues during dipping and during the partial drying that takes place before the coated tub is ready for removal from the machine.

Just after the tub starts to rotate, it dips into the tank containing the slip (Fig. 1). Cams along the track cause the tub to lower for immersion, to lift in passing above the end of the dip tank and, finally, to lower to the inclined position shown in Figs. 2 and 3.

In the inclined position, excess slip drains off all the coated surfaces, leaving the thin coating desired. Drip is collected and returned to the

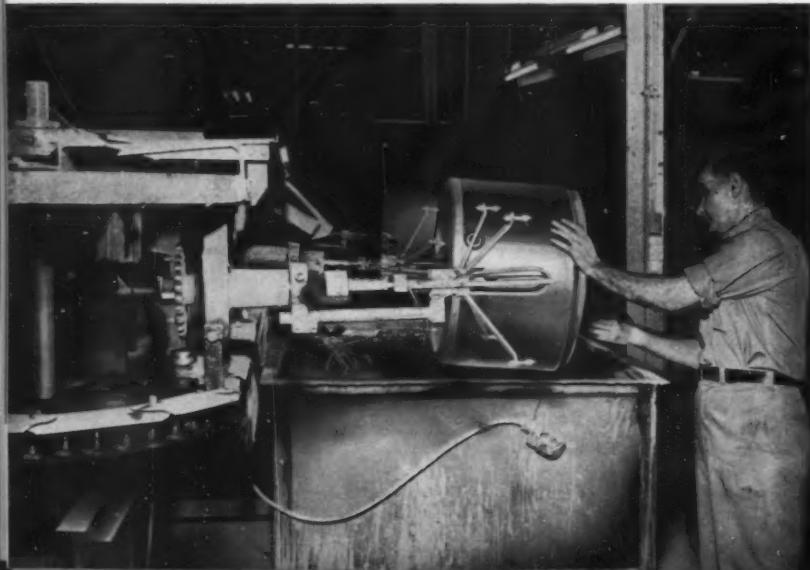
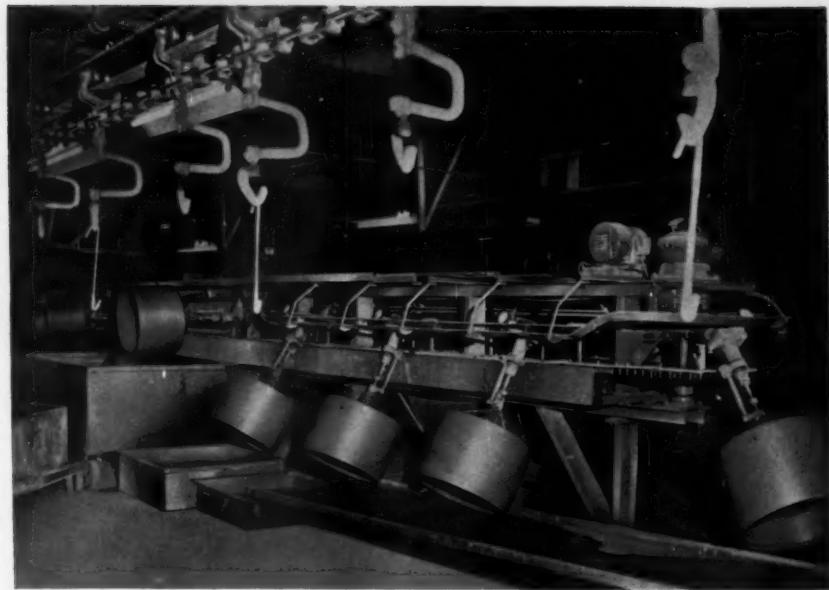


Fig. 1. Washing-machine tubs are hand-loaded on a spider of a loop conveyor. A gear at the inner end of the carrier engages a rack that causes the tub to rotate until it is unloaded.

**Fig. 2.** The rotating tubs coming from the tank (left) are tilted downward to drain off excess slip. Intermittent shaking jars off any drops that may have formed.



mixing room for reblending and re-use. During the drip period, the tubs are jarred or shaken so that any drops of slip formed in draining will fall off and not produce sags. Continued rotation helps to avoid runs and also to minimize variations in coating thickness.

It is noteworthy that the tubs are not touched by hand after they are put onto the spiders. Hooks that are used to unload the tubs pass through small holes in the rim where no noticeable blemishes are left. At a station near the end of the second leg of the conveyor loop, the spider is released from the tub. It is then lifted off and hung from a hook on an overhead chain conveyor with the open side sloping upward (Fig. 3).

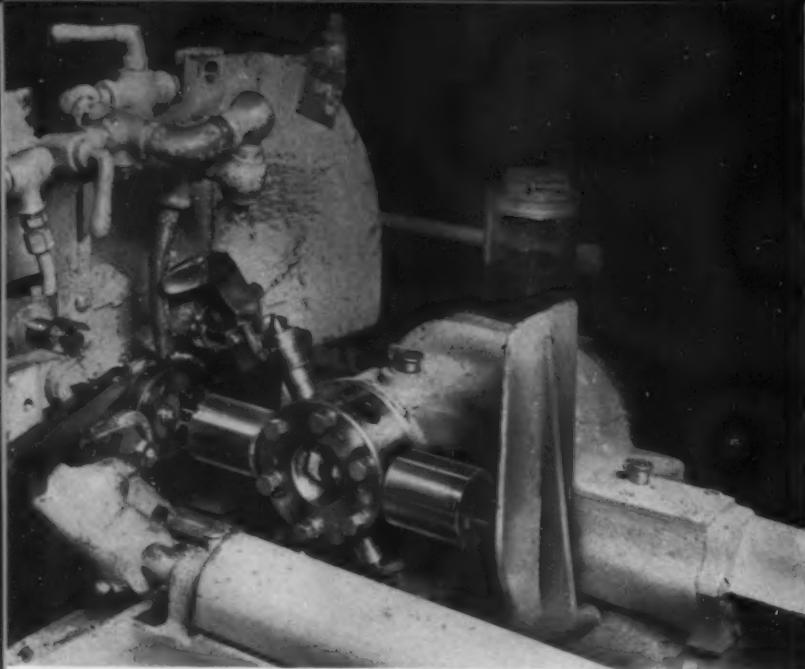
By this time, however, the slip has dried enough to avoid running on the coated surfaces. When on this chain, the tub is carried first

through a drying oven and then through a continuous firing furnace. In the latter, the dry slip is heated to a temperature high enough to melt and fuse the vitreous particles. This forms, in effect, a coating of glass. When the tubs emerge from the furnace, they are somewhat cooled and are blue-black in color. After more cooling, a slip of different composition is applied. This is then fired to produce the final white finishing coat of vitreous enamel.

In applying the ground coat with the conveyor setup here illustrated, only two men are needed—one for loading and one for unloading. When dipping was done by hand, five men were required. Thus, with the production rate the same as before, labor has been reduced by 60 per cent. In addition, a superior coating is obtained and less rework is required.

**Fig. 3.** At rear of conveyor loop, the spider unlocks automatically. A hook is used to transfer the coated tub to a chain conveyor for traverse through a drying oven and a firing furnace.





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Western Electric Co., Inc.  
Chicago, Ill.

## End-Milling from a Screw-Machine Turret

SPECIAL tooling carried in the turret of a screw machine is used for an unusual end-milling operation at Western Electric's Hawthorne plant in Chicago. The work-piece involved, Fig. 1, is an eight-tooth star-wheel shape known as a message-register pinion. It is brought to the machine, a Brown & Sharpe OOG automatic, as an extruded bar. Milling consists of removing metal at four alternate teeth, indicated by the shaded areas in the drawing.

The tooling principle utilizes the spindle drive of the machine to power milling heads carried in the turret, as seen in the heading illustration. Because of the small size of the part, it was impractical to group the four end-mills required in a single head. Instead, two heads, each carrying two end-mills, are mounted in separate turret stations. The cutters in each head are at diametrically opposite points, and the heads work in sequence. When operative, a carrier-spindle in each head revolves in unison with the machine spindle and, in turn, causes the cutters in the head to revolve on their own centers.

Design details are brought out in Fig. 2. Carrier-spindle A, when driven from the machine spindle, serves to revolve the two cutter-spindles B (only one is shown) through the engagement of pinions C on the cutter-spindles with stationary internal gear D. Drive from the machine spindle to the carrier-spindle is transmitted by two spring plunger driving pins E. These pins extend from the carrier-spindle and register against driv-

ing lugs F, which are shaped like clutch teeth on chuck cap G of the machine spindle.

This arrangement also locates the cutter spindles angularly in relation to the teeth of the pinion stock from which the parts are made, the chuck cap being feathered to the chuck by key H, and the chuck to the pinion stock by pins J. The two milling heads differ in the angular positioning of their cutter-spindles, so as to locate all four cuts correctly in relation to the pinion teeth.

Angular position is important. The cutters K have to clear adjacent pinion teeth, so are necessarily small. To preserve accuracy and extend wear life, the driving lugs are formed in a carbide ring L brazed into the chuck cap.

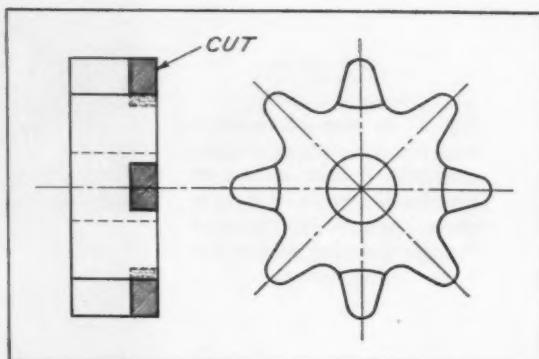


Fig. 1. The shaded areas indicate the pinion surfaces end-milled by the tooling.

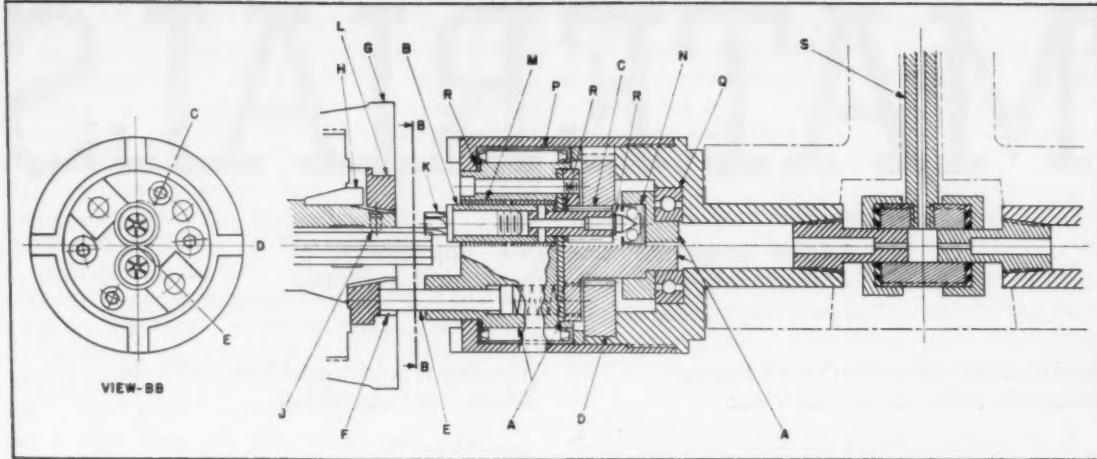


Fig. 2. While carrier-spindle (A) revolves in unison with the machine spindle, end-mills (K) revolve on their own centers.

Chipping of the driving-lug corners is averted by running the machine spindle backward until the turret has advanced the milling head fully on the lead-cam rise. When the spindle is then run slowly forward, the driving pins contact the faces of the driving lugs to full depth. There is no shock condition, as would exist were the spindle running forward at high speed during the engagement of the pins with the lugs.

Within the head each cutter spindle is provided with a pair of replaceable carbide plain radial bearings *M* and a miniature pivot bearing *N* for end thrust. A built-up construction is used for the carrier-spindle to permit its assembly through and on both sides of the internal gear contained in the case. This construction is required because the miniature bearings, although small in diameter, are still too large to pass through the gear.

Assembled, the carrier-spindle sections form a unit, provided with needle bearing *P* at the front and ball bearing *Q* at the back. Economical maintenance is engineered into the tool with inexpensive replaceable wear details *R* and provisions for refitting to a new needle bearing.

Maintenance is further reduced by lubricating the milling heads automatically through the machine turret. By gravity feed, a metered supply of transparent oil flows once in each indexing cycle to a tube *S* through the length of the turret. This tube is connected to both heads and turns with the turret. Centrifugal force, operating with each indexing movement, distributes the oil to the heads under pressure and acts to keep the tooling free of dirt and fine chips.

## *Increased Enrollments at Engineering Colleges*

This year, students are preparing for engineering careers in greater numbers than at any period since 1948. Nearly 243,000 were studying engineering in accredited colleges last fall, according to figures compiled by the United States Office of Education and the American Society for Engineering Education. The total is almost equal to the all-time high of 1947, when World War II veterans were attending college.

The number of senior students in engineering last fall was 20 per cent over 1955, when 24,000 were graduated. Graduate studies in engineering also show a gain in popularity, with 22,240 or 20.8 per cent more students taking courses

leading to a master's degree, and about 3400 or 7.6 per cent working toward a doctor's degree. Engineers graduating with bachelor's degrees during 1955-56 totaled 23,547 compared with 20,200 in the previous year. In 1949-50 there were 48,160 engineers graduated.

While mechanical engineering is the most popular field among graduates of the last eight years, the highest percentage (20 per cent) of this year's undergraduates expect to work for electrical engineering degrees. Nearly 17 per cent are in mechanical engineering with civil, chemical, and aeronautical engineering following in that order.

# MATERIALS

The properties and new applications of materials used in the mechanical industries

## Nickel-Alloy Coatings Protect Ferrous Metals from Corrosion and Wear

A nickel-alloy coating which doubles as a brazing alloy has been made available for industrial applications on ferrous metals by the Tube Reducing Corporation, Wallington, N. J. Known as the "Niphos" process, it is easily applied to all shapes and sizes. After application, parts are heated in a reducing atmosphere to provide a tightly adhering nickel-alloy cladding which will not peel or flake even when subjected to a 180-degree bend. The clad coating may be applied locally to areas which are to be joined by brazing, after which the brazing operation is completed by placing the coated areas in contact and heating. Coatings for corrosion protection are about 0.001 inch thick, but coatings up to 0.025-inch thickness can be obtained in one application. Thickness can be increased still further by repeated applications and can provide resurfacing or build-up of worn base metal areas.

The Niphos coatings can prevent scaling of the base metal at temperatures as high as 1150 degrees F., and coated areas—when properly welded—suffer no loss of corrosion protection in the weld-affected area.

## Permanently Anodized Non-Etched Color Foil Nameplate

A completely and permanently anodized non-etched multicolored foil nameplate called "Mystery-Cal" has been announced by North Shore Nameplate, Inc., 214-27 Northern Blvd., Bayside 61, N. Y. The method of processing employed enables fine line reproduction which permits exact duplication of any desired pattern insignia or motif. The adhesive backing more than meets the tensile requirements of any applicable military specification. The nameplate will not pass current across its surface, which eliminates the possibility of short circuits.

Mystery-Cal nameplates are suited for extremely fine dials, gages, clock faces, calibrated scales, multicolored instrument panels, parking meters, and automobile trim.

## Aluminum Solder and Flux Facilitate Aluminum Fabrication

A high zinc solder (95 per cent zinc, 5 per cent aluminum) called Alcoa Solder No. 805 and a soldering flux called Alcoa Soldering Flux No. 66 that can be used to join heat exchanger return bends, electrical connections, automobile radiators, etc., have been announced by the Aluminum Company of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa. These materials will join all aluminum alloys and make joints between aluminum and other metals such as copper, brass, stainless steel, steel, nickel, etc.

The solder has a melting range of from 715 to 725 degrees F. It works most effectively when preplaced in or near a joint rather than being fed manually. The soldering flux can be applied dry or as a 70 per cent flux, 30 per cent normal propyl alcohol solution. It reacts at 720 degrees F. to wet aluminum with zinc. The flux can be removed by flushing with water heated to 180 degrees F.

## Protective Covering for Fine Metal Finishes

A product called "Onco Protective Covering" for protecting fine metal finishes has been announced by Onco Products, Inc., 201 S. Main St., Middletown, Ohio. The material was developed to protect stainless-steel finishes for curtain wall use. It can withstand 120 hours in a Weatherometer at 140 degrees F.; exposure to rain, sleet, sand, smoke; and handling and shipping hazards. The covering is easy to apply and when stripped, leaves no gummy residue.

## Transparent Vinyl Plastic Tape Available in Nine Colors

A thin but tough tape made from an unplasticized polyvinyl chloride film is produced by Devon Tape Corporation, 519 S. Fifth Ave., Mount Vernon, N. Y. This tape, called "Devoseal" No. 12, is waterproof and resists heat, cold, acids, alkalies, and abrasives. It is a pressure-sensitive

tape, and is said not to dry out or become brittle.

Some of the physical properties attributed to this material are: thickness, 0.0024 inch; tensile strength, 22 pounds per inch of width; elongation at break, 20 per cent; adhesion value, 22 ounces per inch of width; moisture vapor permeability, 0.027 ounces per square foot per 24 hours at 68 degrees F.; dielectric strength, 1,500 volts; and insulation resistance, 15,000 megohms.

Applications include waterproof sealing of chemicals, decorative banding and coding, prevention of galvanic corrosion, and the protecting of items during manufacturing. Colors include yellow, white, red, green, blue, black, pastel yellow, pastel blue, and pastel green.

#### Alloy that Facilitates Production of Bright Aluminum Extrusions

Manufacturers in the automotive, architectural, and appliance fields now have available a material which facilitates the production of brightly anodized aluminum extruded shapes, according to the Aluminum Company of America, 1501 Alcoa Bldg., Pittsburgh 19, Pa. By using this heat-treatable aluminum alloy, designated Alcoa Alloy X6463, manufacturers can, by anodizing, achieve a bright finish on a commercial aluminum extrusion.

Products fashioned from the alloy exhibit similar mechanical properties and can be extruded to the same manufacturing tolerances as those made from Alloy 6063. The company expects that Alloy X6463 will become the standard high-finish extrusion alloy for numerous industries.

Applications include automotive bumpers, grilles, exterior and interior trim panels, window frames, architectural wallfacings, store fronts, ornamental work, railings, and such appliance use as interior trim on refrigerators, washers, dryers, and air conditioners.

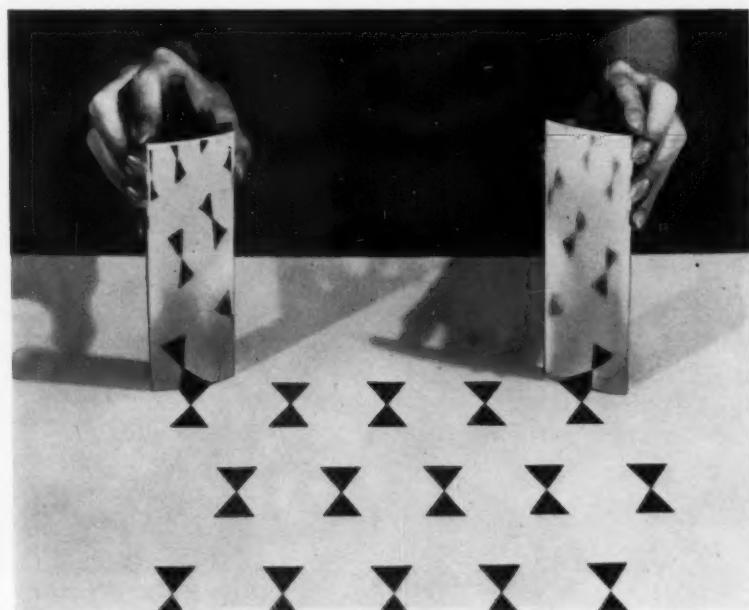
#### Liquid Detergent for Steam Guns and Steam-Cleaning Equipment

Developed to simplify the preparation of steam-cleaning solutions and to reduce the clogging of coils in self-generating steam equipment, this liquid detergent has been placed on the market by Oakite Products, Inc., 126 Rector St., New York 6, N. Y. Called "Oakite LSD," this detergent has been designed for use in solution lifting steam guns and self-generating steam-cleaning equipment for operations ranging from light to medium-heavy duty. It is said to provide effective soil removal at concentrations of 1 to 2 ounces per gallon of water. The liquid is claimed to be safe on steel, brass, and magnesium, and to have no adverse effect on painted surfaces. It has a pH of 12 at the operating range and has no offensive odors.

#### Additives Improve Mechanical Characteristics of Teflon

According to the Enflo Corporation, Route 38 at Airport Circle, Pennsauken, N. J., the additives added to Teflon used in the making of "Enflon" reinforce it and result in higher tensile strength, greater compressive strength, lower coefficient of thermal expansion, lower heat distortion and a

Two samples of aluminum extrusions show that Alcoa Alloy X6463 on the left has an improved reflectivity over the one on the right.



stiffer material that, in general, is less susceptible to cold flow. The material is reasonably stable at 575 degrees F. and is available in tape, rod, tubing, and slugs. It will not cause undue wear on carbide tools and is well suited for use as bearings, valve guides, pressed washers, bushings, inserts, rotating mechanical seals, and gaskets.

#### Enamored Aluminum Sheet that Can be Pressworked

Manufacturers can now turn out handsomely finished aluminum products in a variety of organic finished colors directly from their roll-forming machines, press brakes, or draw or punch presses without subsequent finishing operations, according to the Reynolds Metals Co., 2500 S. Third St., Louisville, Ky. This is achieved by using "Colorweld," a pre-enameded, pre-finished aluminum coil available in widths from 1/2 inch to 36 inches, and in thicknesses from 0.016 to 0.051 inch. The finishes are flexible; resist scratches, abrasions and weathering; and come in twenty colors.

#### Plastic Moldings that Simulate Brass, Chromium, Copper, or Gold

A plastic molding made to function as a protective finishing for edges has been announced by Glass Laboratories, Inc., 65th St. at 9th Ave., Brooklyn 20, N. Y. "Silvatrim" is highly flexible and can be formed and fitted around glass, wood, or spun metal in continuous strips. The material can be mitered with ordinary household shears for angle application and can be nailed or cemented to flat surfaces.

In its manufacture metal foil is locked-in and laminated between two pieces of clear plastic. The material is dimensionally stable, and resists heat and corrosion. It will not crack, chip, or peel.

#### Polyethylene-Cellophane Transparent Tape with Dimensional Stability

A composite polyethylene-cellophane transparent tape called "Rajah" has been announced by General Tape Corporation, First National Bank Bldg., St. Paul 1, Minn. The tape is made up of polyethylene (60 per cent) and cellophane (40 per cent). It is resistant to normal atmospheric changes and is therefore dimensionally stable. The tape compares favorably with other types of cellophane tape from cost and mechanical property standpoints. The tape is available in a 2592-inch length in widths of 3/8, 1/2, 3/4, and 1 inch.

#### Cutting Fluids for Tough Ductile Metals Now Available

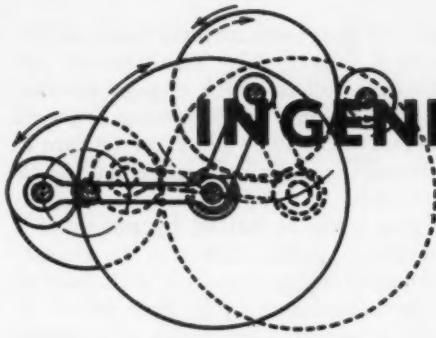
The Regal Division of Beloit Tool Corporation, P. O. Box 30, Beloit, Wis., has announced two cutting fluids for use in tapping, drilling, milling, hobbing, and threading operations. They are: "Jet-Cut Number 9" and "Flo-Cut Number 15." Number 9 can be applied directly from the can by brush or squirt oiler and may be diluted if the job is not too severe. Number 15 is used in circulating, drip, wick, and vapor or mist systems. Both cutting fluids are odorless.

#### Threading and Tapping Lubricant That Reduces Tap Breakage

A threading and tapping lubricant that reduces the risk of tap breakage has been announced by The DoALL Co., 254 N. Laurel Ave., Des Plaines, Ill. This compound, called "Tapit," can be used on metals including titanium and stainless steel for such operations as drilling, reaming, sawing, boring, and broaching as well as tapping and threading. The material is packaged in an 8-ounce tube and 1-, 2 1/2-, 5- and 10-pound containers.



These represent a few of the plastic lenses offered by Optics Mfg. Corporation, Amber and Willard Sts., Philadelphia 34, Pa., to meet a wide range of industrial needs. They can be precision ground and polished and will serve as condensers, magnifiers or viewers.



# INGENIOUS MECHANISMS

Mechanisms selected by experienced machine designers as typical examples applicable in the construction of automatic machines and other devices

## Rotary Work-Table with Mechanism for Automatic Indexing

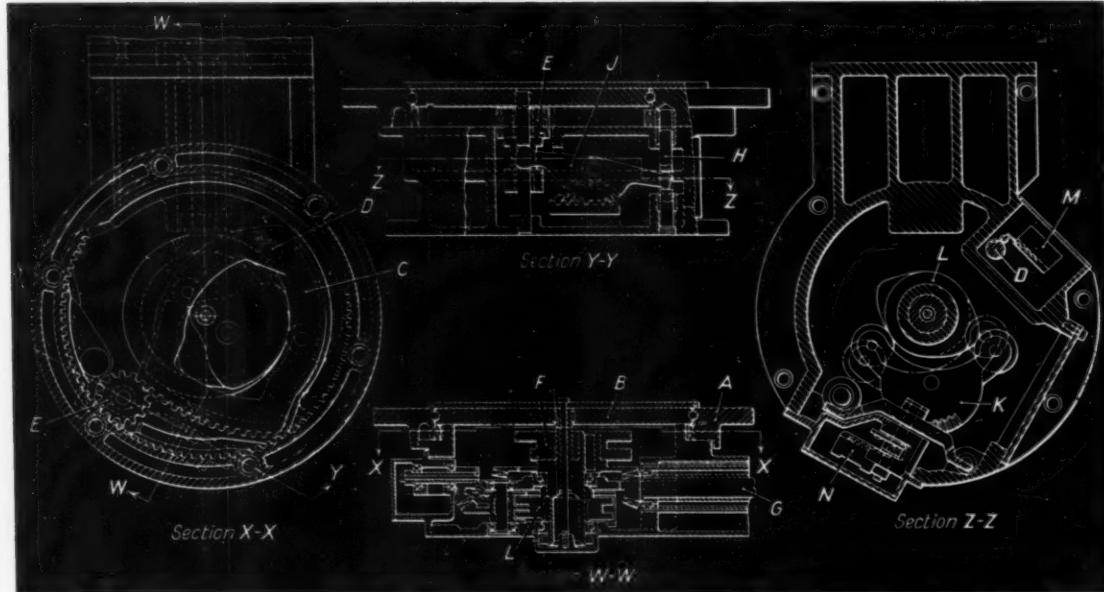
An indexing work-table that can be used in conjunction with independent cutter-heads to form an automatic multiple-spindle machine is here illustrated. The table is intended to receive several work-holding fixtures according to the number of indexing stations provided. A variety of machining operations may be performed automatically while the work-pieces are located at these stations.

Referring to sectional view W-W, annular table A rotates on steel balls which surround fixed central disc B. Indexing is carried out by means of gear segment C (section X-X) which is secured to spindle D. The latter component is mounted in ball bearings which are housed in disc B and in the base.

Motion from gear segment C is transmitted by pinion E, which engages gear teeth in the bore of the table. The indexing action is controlled by compound cam F (section W-W) which engages follower rollers housed in recesses in the gear segment C and is driven by bevel gears from the shaft G. Drive to this shaft is taken from a motor, through V-belts, an electromagnetic clutch, and brake units. This driving equipment is not shown in the illustration.

At the beginning of the cycle, segment C is caused to dwell for a period, and the indexing motion is then completed during a 210-degree angular movement of cam F. Subsequently, segment C is again caused to dwell before it is returned to its original position. This is done in

Sectional views of work-table that can be set up for automatic indexing. Limit switch (M) stops indexing cycle and switch (N) starts machining cycle.



preparation for the next indexing cycle in the course of the final 90-degree angular movement of cam *F*.

During the dwell periods of the segment *C* before and after the indexing movement, pinion *E* and plunger *H* (section Y-Y) are moved vertically in opposite directions by lever *J*. At the beginning of the cycle, the plunger is withdrawn from one of a number of holes provided in the under side of the table at the indexing positions. Simultaneously pinion *E* is brought into engagement with the gear teeth in the table for the indexing movement. After indexing has been completed, the plunger is inserted into the next hole in the table. The latter is, therefore, positively located while the machining operations are being carried out on the work-piece. At the same time, the pinion is withdrawn from the gear teeth in the table in preparation for the return movement of the segment. At certain points in the cycle, the pinion and the plunger are in simultaneous engagement with the table, so that the latter is positively located during the entire indexing operation.

Movement is transmitted to the pinion and the

plunger by bevel gear teeth on lever *J* and on pivoted segment *K* (section Z-Z). The segment carries two follower rollers which engage simultaneously with compound *L*. This cam is keyed to the lower end of the shaft which carries cam *F*. The arrangement may be seen in section W-W of the illustration.

The indexing cycle is started by means of a switch (not shown) which activates the electromagnetic clutch to engage the drive with shaft *G*. At the end of the indexing cycle, limit switch *M* (section Z-Z) is operated by means of a detent on the lower end of spindle *D*, with the result that the clutch and consequently the drive to the shaft *G* are disengaged. Concurrently, an arm attached to the pivot spindle for the lever *J* actuates the limit switch *N* to start the cycle of the cutter-heads.

A feature claimed for the arrangement is that a uniform torque is applied to gear segment *C* during the entire operating cycle to produce a particularly smooth indexing motion. This mechanism has been patented by L. A. Hautau, Detroit, Mich.

## Hydraulic Copying System Controls Two Lathe Tools

A patented hydraulic copying system for a railroad car wheel lathe is shown in the accompanying drawings. This device permits simultaneous turning on the tread and flange portions of the car wheel by separate, single-point cutting tools.

Thus, cycle time can be reduced and production increased.

As seen in Fig. 1, the cutting tools are mounted on compound slides *A* and *B*, which can be traversed parallel with the work axis on way *C*. The entire assembly can be adjusted toward or away from the work on ways provided on the base.

During the machining cycle, rotation of shaft *D* causes slide *A* only to be traversed parallel with the work axis for turning the tread portion of the wheel. The required tapered form of the tread is produced by the action between a follower roll attached to the slide and the template *E* (section X-X in Fig. 2) which is secured to way *C*.

This traversing motion causes a piston-rod attached to slide *A* to be moved axially in cylinder *F*. As a result, hydraulic fluid is discharged from the inner end of this cylinder, and through pipe *G* to a spool-valve *H*. When profile-turning is not being performed on the wheel flange, the fluid is directed from the valve through pipe *J* to the inner end of cylinder *K*. The piston-rod of this cylinder is attached to slide *B*. Thus, slides *A* and *B* are traversed in the same direction at similar speeds.

As shown in section Y-Y of Fig. 2, valve *H* is attached to one end of a piston-rod. The opposite end of this rod is coupled to the slide carrying the cutting tool for profile-turning the wheel flange. Cylinder *L* is fixed to slide *B*. When pro-

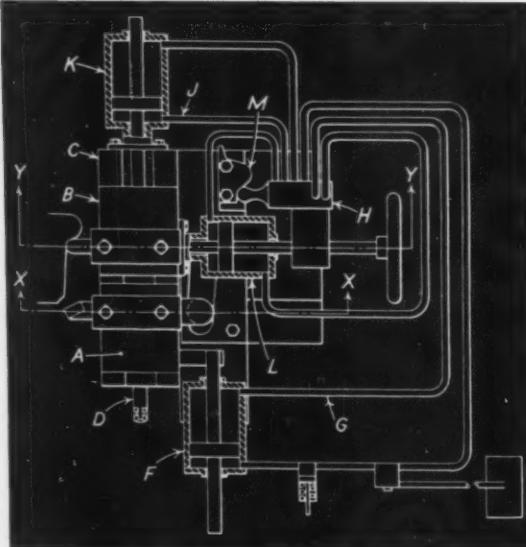
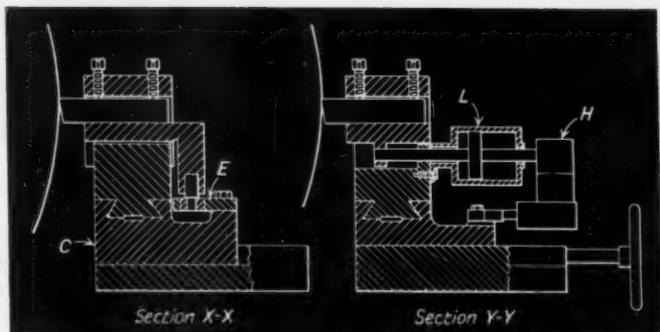


Fig. 1. Plan view of a hydraulic copying system for a railroad car wheel lathe that permits turning tread and flange portions simultaneously.

Fig. 2. Sectional views of copying system illustrated in Fig. 1 show template (E) for tread form, and spool-valve (H) attached to piston-rod of cylinder (L).



file-turning the flange, a spring-loaded follower (mounted on one end of the valve-spool) is held in contact with template *M*, which is fixed to way *C*.

When the valve-spool is moved outward, due to the action of the template on the follower, the hydraulic fluid from cylinder *F* is directed simultaneously to the inner ends of cylinders *K* and *L*. As a result, the traverse rate of slide *B* is reduced, and the profiling tool is moved away from the work axis to turn half the wheel flange. When the

largest diameter of the flange has been turned, the valve-spool is moved in the opposite direction by spring action. This keeps the follower roll in contact with template *M* as slide *B* continues to move in the same direction.

The hydraulic fluid is then directed to the outer end of cylinder *L*, as well as to the inner end of cylinder *K*. In this way, the profiling tool is moved toward the work to turn the other half of the wheel flange, reproducing the shape of template *M* on the work-piece.

## Ceramic and Carbide Tool Performance Tests

Data on tool life performance of typical carbide and ceramic single-point tools were presented in Part I of a paper presented before the last annual meeting of the American Society of Mechanical Engineers. An abstract of this report, entitled "Ceramic Tooling Tests at Kearney & Trecker," was published on pages 175 to 181 in the January, 1957, number of *MACHINERY*.

Part II was presented at a joint session of the Metal Processing Research Committee and the Production Engineering Division at the ASME semi-annual meeting, San Francisco, Calif., June 9-13, 1957. A. O. Schmidt, B. F. von Turkovich, and J. R. Roubik, Kearney & Trecker Corporation, Milwaukee, Wis., and I. Ham, University of Wisconsin, Madison, Wis., collaborated on this report.

This concluding installment of the report considers tool forces and temperatures in orthogonal turning of SAE 1015 steel tubing with carbide and ceramic single-point tools. Tests were run at feeds of 0.005 and 0.010 inch per revolution, and at speeds of 150, 200, 300, 400, 500, and 600 feet per minute.

It was found that under identical cutting conditions, ceramic and carbide tools exhibit practically the same cutting forces, specific cutting energy, manner of chip formation, and angle rela-

tionships. Also, these quantities are influenced in approximately the same manner by variations in cutting speed, feed, and rake angle. Larger values of cutting force, specific energy, shear strain, and cutting temperature due to shear are associated with the more blunt or negative rake angles, and lower cutting speeds.

Cutting temperatures for ceramic and carbide tools were determined analytically and plotted in relation to cutting speeds and rake angles. The power consumption was also measured and the energy, in horsepower per cubic inch per minute, was computed from force measurements to provide data on the actual power requirements for both carbide and ceramic tools.

Both cutting tool materials show an increase in interface temperatures as the rake angle is changed in the direction from negative to positive. The ceramic tools performed slightly better than the carbides at higher cutting speeds. However, chip-tool contact length or area was smaller for ceramic. Also, both the temperature rise due to friction on the tool face and the average interface temperature were higher for the ceramic tools than for the carbides tested under the same conditions. Smaller contact area and lower thermal conductivity for the ceramics were responsible for the higher interface temperatures.

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

## Drill Jig for Uniformly Spaced Radial Holes

FRANK L. RUSH, Columbus, Ohio

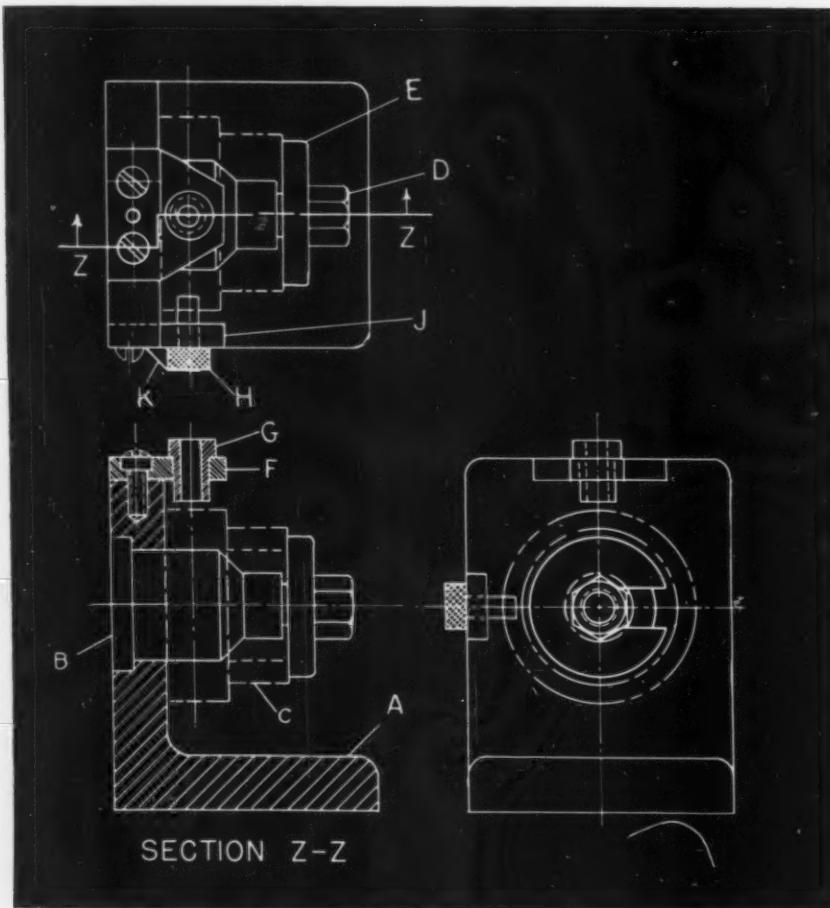
When drilling holes spaced at 90-degree intervals around the periphery of a bored cylindrical work-piece, a jig of simple construction can be used. One such jig, employing a piece of standard angle-iron to form the base, is shown in the accompanying illustration. With some modifica-

tion, other angular spacings for the holes are possible.

The base A, finished on all seating and locating surfaces, has one leg fitted with a positioning pin B. This pin is machined to a slip fit in the finished bore of the work-piece C and is threaded at the free end. Standard hexagon nut D and a C-washer E serve to hold the work-piece in place against the vertical finished surface of the base.

A bushing plate F, secured to the top of the upright portion of the base with cap-screws and dowels, centers the drill bushing G over the axis of pin B. An index-pin H is carried in a plate J attached to side of the base. This pin is machined to fit the drilled holes and is positioned 90 degrees to the axis of the drill bushing. A flat spring K, attached to the base, holds the indexing pin in place.

In operation, the work-piece is placed on pin B and clamped



Drill jig that has an indexing pin for locating radial holes in bored cylinders at 90-degree intervals.

in place. After drilling the first hole, the nut is loosened, and the work-piece revolved until the index-pin enters the hole. Nut  $D$  is then retight-

ened and the second hole drilled. This process is continued until four holes are produced. Spacing accuracy depends on index-pin clearance.

## Adjustable V-Block Facilitates Setting Up of Multiple-Diameter Shafts

WILLIAM MORSON, Birkdale, England

A standard V-block that has been modified to provide for accurate height adjustment is here illustrated. When the altered V-block is one of a pair supporting a shaft on two different diameters, the need for shims of precise thickness is eliminated. The ordinary functions of the V-block are not impaired by the modification.

A standard 90-degree V-block  $A$  is modified as shown in the illustration. Slot  $B$  is machined centrally along the base of the V-block in the direction of its longest dimension. The sides of this slot are accurately ground square and parallel. The depth of the slot is held constant throughout its length, and the width should be about  $1/4$  inch less than that of the V-block. For convenience, the depth of the slot was made 0.750 inch.

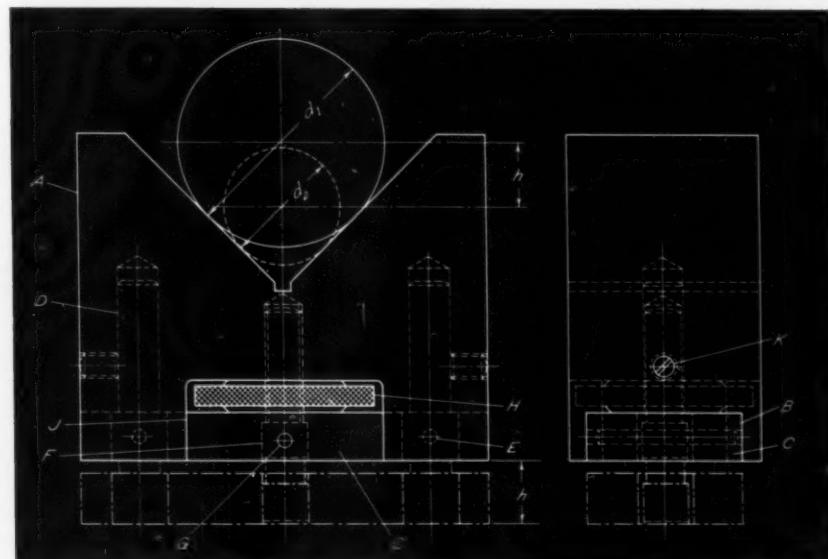
A rectangular steel baseplate  $C$  is hardened and ground to a close fit in slot  $B$ . This plate is the same length as the V-block and its thickness equals the depth of slot  $B$ . These sizes are held to precision limits. Two hardened and ground steel guide rods  $D$  are affixed to the baseplate by pins  $E$ . The rods should project from two and one-half to three times the thickness of the baseplate and

be exactly perpendicular to the top of that member. Reamed holes machined into the V-block from the base of slot  $B$  allow these guide rods to slide smoothly.

Threaded stud  $F$ , which stands perpendicular to baseplate  $C$  is fastened at one end by cross-pin  $G$  within a hole in the center of that plate. This stud has a fine pitch thread. A clearance hole is bored in the V-block to accommodate the projecting end of the stud. Knurled nut  $H$  is of large diameter and is located on the stud above the upper side of the baseplate. This nut is housed within a slot  $J$  that is machined centrally across the bottom of the V-block in a direction perpendicular to slot  $B$ . This slot is large enough in both width and depth to provide working clearance for the nut. To insure that nut  $H$  bears evenly upon the base of slot  $J$ , the latter is made exactly parallel with the bottom of the V-block.

By rotating the nut, the height of V-block  $A$  above the baseplate  $C$  can be adjusted smoothly and gradually. In whatever setting the V-block is placed, it is held parallel with the baseplate by guide rods  $D$ . The fine pitch of the threads on

A V-block that can be adjusted to any desired height within certain limits for supporting multiple-diameter shafts.



stud *F* and the large diameter of nut *H* allow the V-block to be given a very fine height adjustment. As the stud in this case has 40 threads per inch, one complete revolution of the nut moves the V-block vertically 0.025 inch. The lower face of the nut, which is exposed in slot *J* may be graduated with twenty-five equally spaced divisions to facilitate adjustment of the V-block. Each division represents a 0.001-inch vertical movement.

Baseplate *C* can be locked in any given setting by means of set-screws *K*, which are located in holes drilled and tapped horizontally in opposite ends of the V-block. These set-screws bear against the side of guide rods *D* in each case.

When the V-block is locked in a raised position, as indicated by light dot and dash lines, the weight of a shaft mounted in the V-block is supported by the nut *H*.

When a shaft is to be held on two different diameters, this V-block is used in conjunction with a standard V-block. It is preferable that the dimensions of the standard V-block be identical with those of the adjustable V-block before modification. In this event, the required adjustment *h* of the modified V-block for holding a shaft with a known difference in diameters ( $d_1 - d_2$ ) can be determined by means of the following equation:

$$h = (d_1 - d_2) \times 0.7071$$

## Mandrel Expanded from Revolving Center

H. J. GERBER, Stillwater, Okla.

An expanding stub mandrel, controlled from a revolving center, cuts loading and unloading time for secondary lathe operations. It has wide application; the principal requirement is that the work have a finished bore and one finished face.

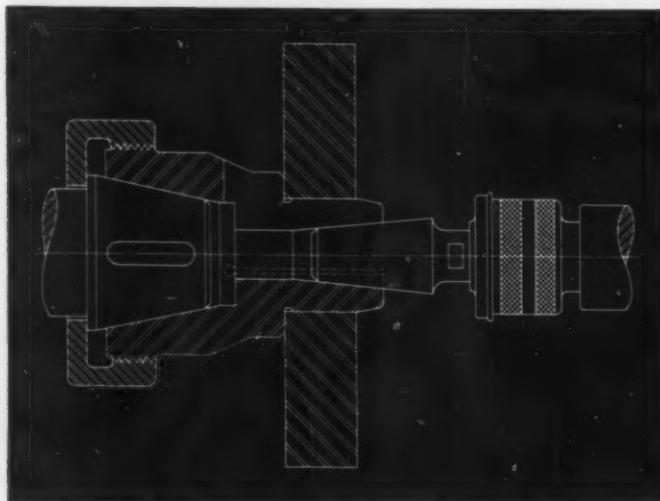
The device is shown in the accompanying illustration. At its left end, the mandrel corresponds in design to the lathe spindle. In this instance, the mandrel is threaded externally and tapered internally for an American Standard spindle. The right end of the mandrel is reduced in diameter to fit the work bore. This surface is cylindrical, except for its very end, which is beveled slightly to aid in loading the work.

There are three slits through the body of the mandrel, extending from the right end to the center. These are spaced radially at 120 degrees and provide a necessary amount of flexure. In-

ternally, the right end is bored to a slow taper to receive an expander plug carried by a revolving center held in the tailstock spindle.

Several manufacturers of ball-bearing revolving centers design them with a removable center point, usually threaded to the rotating part of the tool. Wrenching flats on the point provide easy removal. The expander plug has a threaded shank, corresponding to the thread in the rotating part, so that it is readily interchangeable with the regular center point. All bearing surfaces of the stub mandrel and expander plug are hardened and ground.

To grip the work, the tailstock spindle is advanced and locked, with the expander tightly in the end of the mandrel. For loading and unloading, the tailstock spindle is unlocked and retracted.



The work is secured to the mandrel by the thrust of the expander plug carried by the revolving center.

# SHOP KINKS

## Spring Testing Device with Indicating Lamps

CLINT McLAUGHLIN, Rockaway Beach, N. Y.

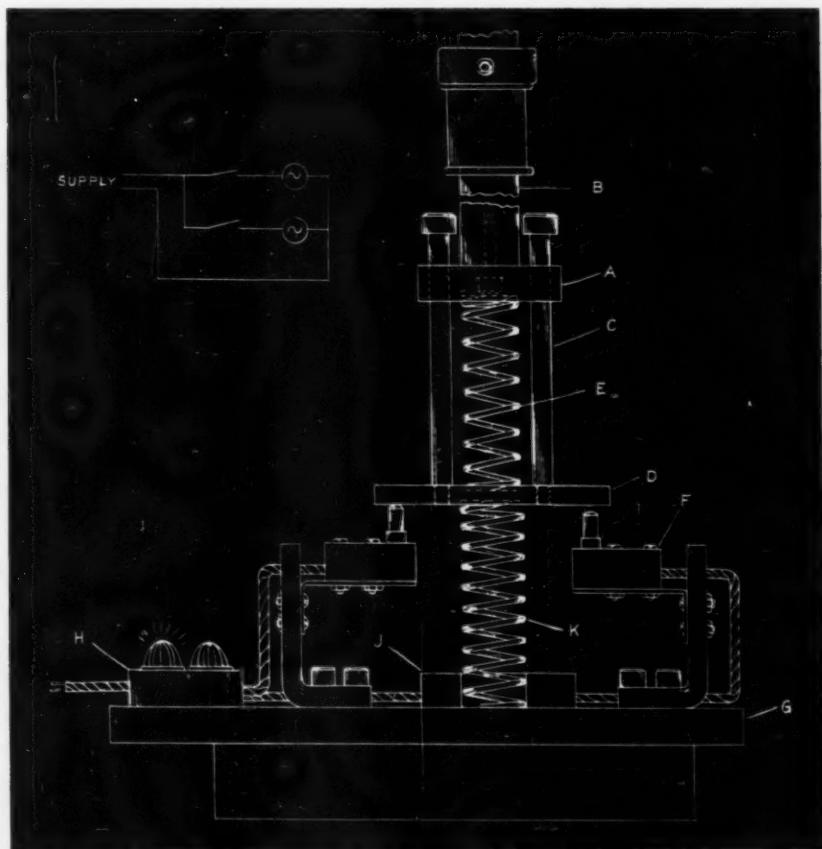
A fixture that may be conveniently used for testing helical springs in quantity is here illustrated. This device utilizes the relative displacement of the springs when acting in compression against a common test spring. Indicating lights automatically classify each component either as too weak, too stiff, or within allowable limits.

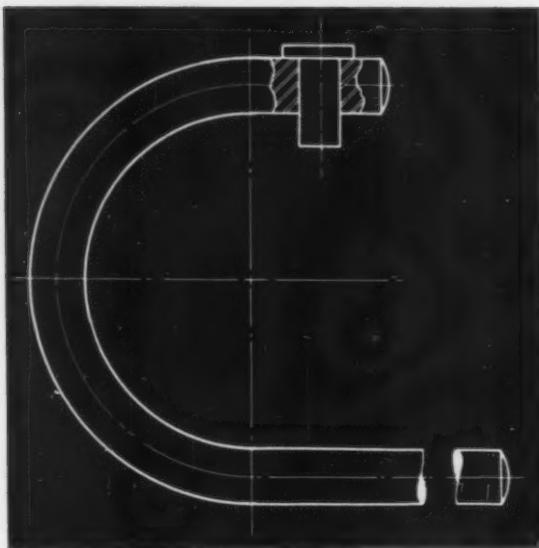
Top plate A, secured to the ram B of a small arbor press, acts as a guide for the four stripper bolts C and the lower plate D. Located by recesses, the common test spring E is placed between these plates. Vertically adjustable brackets, F, mounting two micro switches, are bolted to the baseplate G. Indicating lights H and spring nest J are also provided. The electrical circuit for the device is wired as shown in the diagram.

In use, a work-piece K with the characteristics of the stiffest acceptable spring is placed in the fixture and compressed to the height at which the pressure requirement is specified. A stop-collar is then locked in place on the top section of the ram, and the left micro switch is adjusted by raising until the connected lamp just lights. The right switch is similarly set to light the second indicator when springs with strengths below the minimum permissible are tested.

At this point, the fixture is ready for use. Components that are too weak cause both lamps to light, overly stiff parts give no indication, and when a spring that has characteristics within the allowable variation is tested only one light is illuminated.

Spring has characteristics within permissible limits when one indicator lights. Fixture is set with springs of known value.





Length of steel rod is bent to shape and fitted with a hardened pin to form a serviceable spanner wrench.

### Improvised Spanner Wrench

F. L. RUSH, Columbus, Ohio

A spanner wrench that will prove satisfactory can be improvised from a length of steel rod. The rod should be bent as illustrated to a radius slightly larger than that of the part it is to engage. A hardened steel pin, approximately 0.005 inch smaller in diameter than the hole it is to enter, is pressed into the short end of the rod. The handle is of suitable length and can be knurled for improved gripping.

### Reboring Worn Lathe Tailstock

J. RANDOLPH LUCAS, Richmond, Va.

Inaccuracies in a lathe tailstock can sometimes be traced to a worn spindle bearing surface. A method for reboring the tailstock and to also realign it with the bed ways of the lathe is here presented.

In view X of the illustration, the

**Reboring worn bearing surface of a lathe tailstock.** By supporting both ends of boring bar (B) in line with headstock spindle, proper alignment of tailstock is obtained.

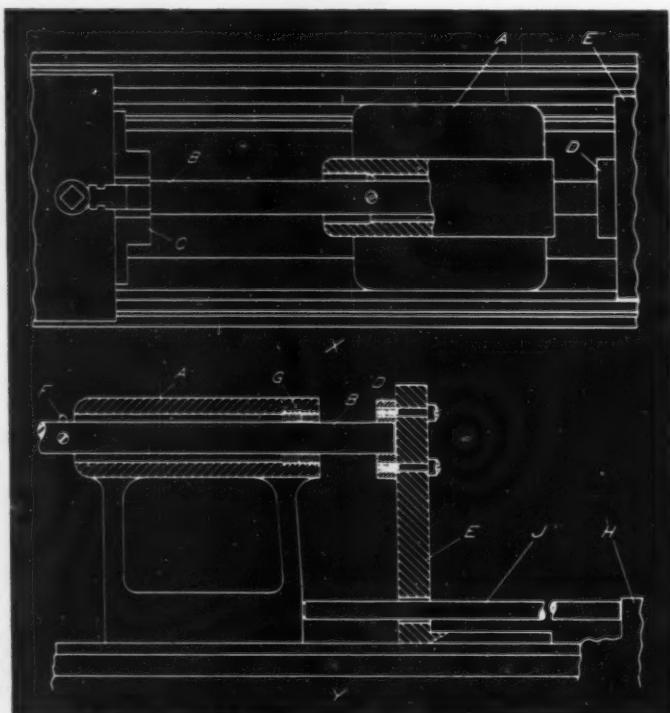
spindle is removed from tailstock A, and boring-bar B (driven by four-jaw chuck C) is passed through the bearing bore. A bronze bearing D, attached to angle-bracket E, supports the end of the boring-bar as seen in view Y. C-clamps (not shown) can be used to fasten this angle-bracket to the lathe bed. Boring bit F is adjusted so that the minimum amount of metal necessary to true the spindle bearing surface will be removed in machining. In this way, damage to thread G is prevented.

Travel of the tailstock along the lathe bed during the boring operation is provided by the automatic feed of lathe carriage H. To transfer the movement from the carriage to the tailstock, pusher-rod J is placed between the two members. The rod passes through a clearance hole in the angle-bracket as shown.

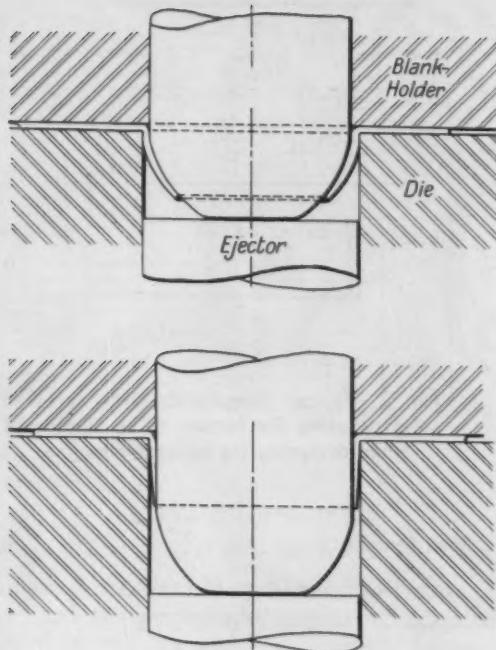
A weight can be placed on the tailstock to hold it down during the operation. Also, the bed ways of the lathe should be well oiled. After the boring operation is completed, a new spindle must be made to fit the tailstock.

\* \* \*

The automotive industry is the largest direct consumer of stainless steel. Last year the industry used over 100,000 tons and since the average use per car has been increased, this year's use should be considerably higher.



September 1957



Several points should be analyzed before designing tools to extrude holes in sheet-metal components. Such factors as neck diameter, neck height, and material thickness must be taken into account. One consideration directly affecting the success of the operation is the size of the initial hole.

W. RICHARDS

## WHAT TO CONSIDER WHEN TOOLING FOR EXTRUDED HOLES

FROM the viewpoint of the tool designer, the manufacture of sheet-metal parts with extruded holes is frequently problematical. Extensive use of the trial-and-error road to decision is usually resorted to. This cost in time and material can be minimized by referring to the accompanying empirically compiled tables and, especially, the charts that spring from them.

Some examples of these components, and a few applications, are given in Fig. 1. Extruded neck to be dealt with here is that for which repeated operations. However, the only type of neck to be dealt with here is that for which the

material is taken from the circular area defined by diameter  $D$  (Diagram 1, Fig. 2) in a single plunging operation.

### *Fundamental Formulas Governing Displacement of Affected Area*

Among the questions that come to mind when considering the tool design are the following:

1. What is the maximum neck height that can be produced?
2. Should a hole punch be used to produce an initial opening, or should a sharp-pointed tool be

used to minimize the loss of metal available for forming the neck?

3. What size should the initial hole be in relation to the diameter and height of the required neck?

4. What influence will the material thickness have on the results obtained?

Before airing these questions it would be advisable to derive some fundamental formulas. Assuming that the material in Diagram 1, Fig. 2, is infinitely thin, and that pre-piercing with a sharp-pointed tool has been carried out to reduce metal loss, then the neck will be produced from the material contained within diameter  $D$ . The over-all height of the extruded neck can be referred to as  $h$ . Then, the surface area of the neck theoretically will be equal to the surface area of circle  $D$ .

It would appear, under these conditions, that  $h$  cannot exceed  $1/4 D$ . However, for material of finite thickness, the value of  $h$  will always exceed  $1/4 D$  as will be subsequently shown.

Because of the tendency toward neck fracture, pre-piercing as described is not recommended for general practice. Risk of fracture can be minimized by pre-punching a hole in the center of circle  $D$ , Diagram 2, Fig. 2. The material available for forming the extruded neck is then equal to the area of circle  $D$  minus the area of circle  $d_1$ , or surface area of neck equals surface area of  $D - d_1$ :

$$\pi Dh = \frac{\pi (D^2 - d_1^2)}{4}$$

therefore, 
$$h = \frac{D^2 - d_1^2}{4D} \quad (1)$$

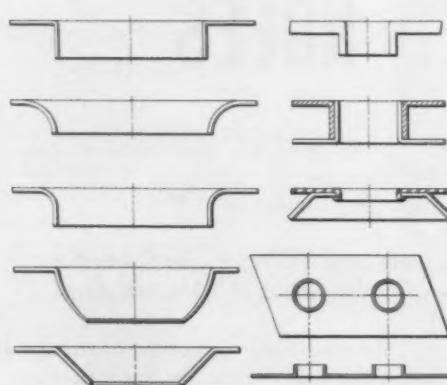


Fig. 1. Varied examples of sheet-metal parts with extruded holes and some applications.

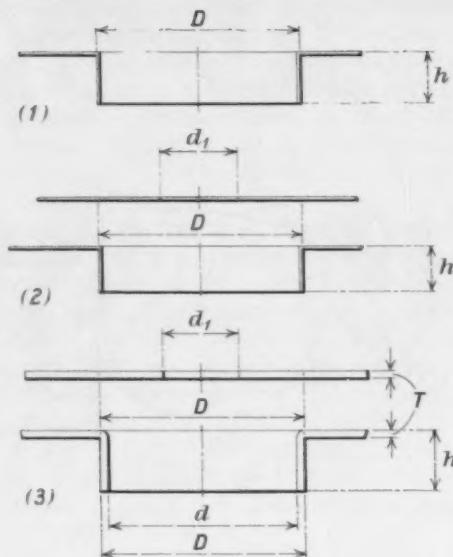


Fig. 2. Typical components with extruded holes denoting the factors to be considered when designing the necessary tooling.

From Formula (1):

$$4 Dh = D^2 - d_1^2$$

therefore, 
$$d_1 = \sqrt{D^2 - 4 Dh} \quad (2)$$

In Diagram 3, the material has a thickness  $T$ . It is now necessary to consider the volume of metal in the annulus  $D - d_1$  and in the neck. Both of these volumes are the same. Then, volume of the neck equals volume of the annulus  $D - d_1$ :

$$\frac{\pi (D^2 - d_1^2) h}{4} = \frac{\pi (D^2 - d_1^2) T}{4}$$

therefore, 
$$h = \frac{(D^2 - d_1^2) T}{(D^2 - d_1^2)} \quad (3)$$

But since

$$T = \frac{D - d}{2}$$

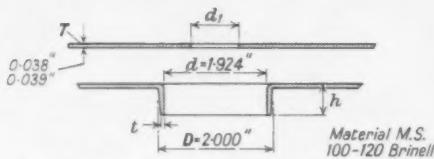
and 
$$D^2 - d_1^2 = (D + d)(D - d)$$

then, 
$$h = \frac{D^2 - d_1^2}{2(D + d)} \quad (4)$$

or 
$$h = \frac{(D - d_1)(D + d)}{2(D + d)} \quad (4a)$$

Formulas (3), (4), and (4a) will give height  $h$  of the neck when starting with definite values for  $d$ ,  $d_1$ ,  $D$ , and  $T$ . Generally, however, it is required to produce a neck to a specific height  $h$ , the principal consideration then being diameter  $d_1$  of the initially punched hole.

**Table 1. Effect of Initial Hole Diameter on Neck Height**



| No. | Initial Hole Dia.<br>$d_1$<br>(in.) | By Formula 4<br>$h = \frac{D^2 - d_1^2}{2(D + d_1)}$<br>(in.) | Actual Mean Height<br>(in.) | Gain in Height percent | By Approx. Formula<br>$h = \frac{D - d_1}{2}$<br>(in.) | Thickness<br>$t$<br>(in.) |
|-----|-------------------------------------|---|-----------------------------|------------------------|--|---------------------------|
| 1   | 5/8                                 | Fractured   |                             |                        |  |                           |
| 2   | 1/8                                 | 0.449   | 0.637                       | 20.005                 | 0.656  | 0.023                     |
| 3   | 0.830                               | 0.422   | 0.557                       | 20.003                 | 0.585  | 0.024                     |
| 4   | 0.995                               | 0.383   | 0.487                       | 20.003                 | 0.502  | 0.028                     |
| 5   | 1.130                               | 0.347   | 0.429                       | 20.004                 | 0.435  | 0.029                     |
| 6   | 1.250                               | 0.311   | 0.373                       | 20.005                 | 0.375  | 0.031                     |
| 7   | 1.370                               | 0.270   | 0.324                       | 20.002                 | 0.315  | 0.033                     |
| 8   | 1.470                               | 0.234   | 0.284                       | 20.003                 | 0.265  | 0.034                     |
| 9   | 1.570                               | 0.196   | 0.237                       | 20.002                 | 0.215  | 0.035                     |
| 10  | 1.670                               | 0.154   | 0.192                       | 20.002                 | 0.165  | 0.036                     |
| 11  | 1.750                               | 0.119   | 0.147                       | 20.002                 | 0.125  | 0.037                     |

From Formula (4):

$$2h(D + d) + d_1^2 = D^2$$

therefore,  $d_1 = \sqrt{D^2 - 2h(D + d)}$  (5)

Although the formulas presented so far are of value in designing tools for producing extruded holes, they will not yield exact results in their present form. Several factors have been ignored. In Fig. 3, the process of forming a neck is compared with that of drawing a shell from a flat blank.

During the drawing operation at A, the metal flows over the curved entrance to the die and tends to thicken. It is restrained from doing so by the clearance between the punch and the die opening and by the pressure-pad securing the remainder of the blank. Thus, complete control of component wall thickness is achieved.

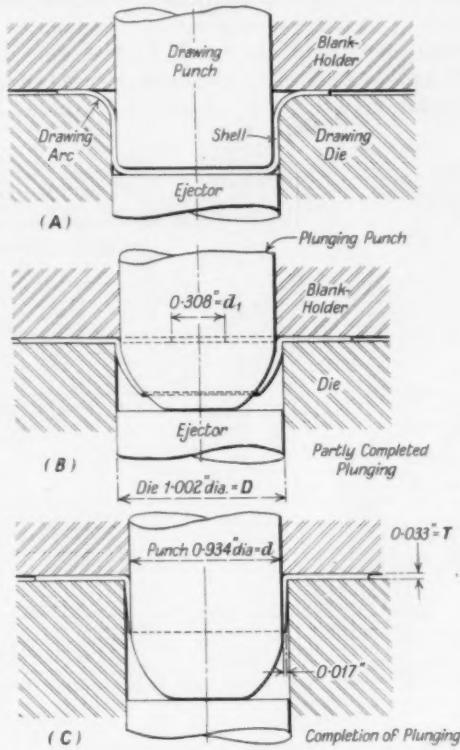
When extruding a hole, no material is drawn from beyond diameter  $D$ , as noted at B in the illustration. The entrance to the die may, therefore, be sharp. As the material is stretched over the end of the punch, it hugs the surface and is comparatively free in the bore of the die. In the illustrated case, which is extreme, the diameter of the original hole  $d_1$  was enlarged three times. Under these conditions a considerable amount of stretching occurs, causing a reduced thickness at the free end of the neck. This reduction results in an increase in height  $h$  over that computed by the given formula.

### How Calculated Results Compare with Empirical Data

A series of tests was methodically carried out to provide authentic data that could be compared to theoretical results. From this data, formulas and graphs will be derived which will yield values close to those required for production purposes.

First, four groups of tests were made—the neck diameter and material thickness remaining constant within each group. The intentionally varied item was the initial hole diameter  $d_1$  to determine its effect on neck height  $h$ . Neck diameters for the four test groups were 2.000, 1.002, 0.750, and 0.500 inches.

Table 1 contains all the pertinent information concerning the parts having a 2.000-inch diameter neck. The material used was annealed mild steel with a Brinell hardness ranging from 100 to



**Fig. 3. The action of a drawing punch and die (A) is compared to that of a punch and die, (B) and (C), for extruding holes. At B and C, no metal is drawn from beyond the circle of diameter (D).**

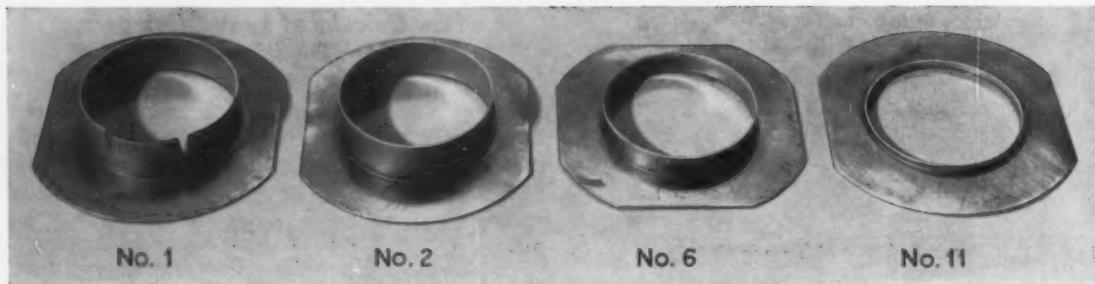


Fig. 4. Four of the test parts used in the compilation of Table 1.  
It will be noted that when the initial hole diameter was  $5/8$  inch  
(Test 1), considerable fracture occurred.

120. It will be noted that when  $d_1$  was  $5/8$  inch, fracture occurred at the free end of the neck. This can be seen at the extreme left in Fig. 4. When  $d_1$  was increased to  $11/16$  inch in diameter (No. 2), the results proved satisfactory. It can then be said that the  $11/16$ -inch value, which is equal to  $0.344 D$ , is the minimum permissible diameter of  $d_1$  for this particular series of components.

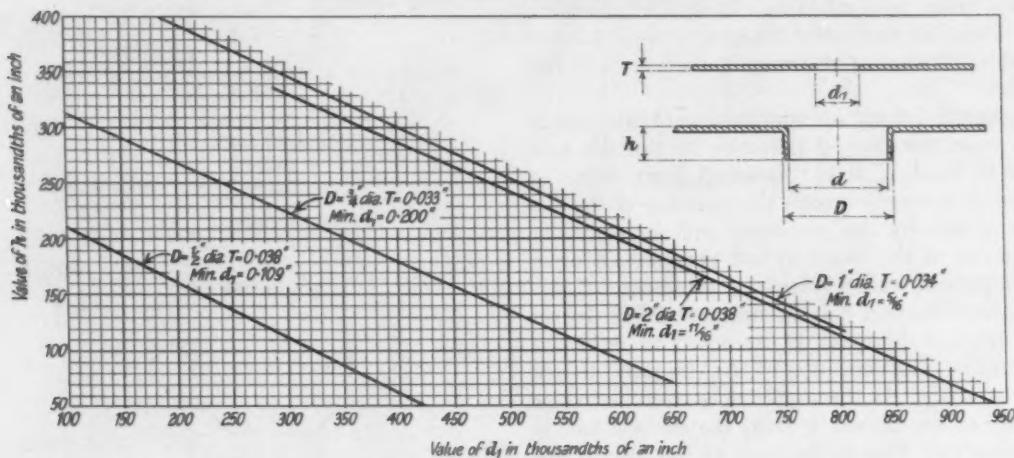
Actual height of the neck in test No. 2 is 0.637 inch—a gain of 42 per cent over the figure of 0.449 inch obtained by applying Formula (4).

The material was reduced from a blank thickness of 0.038 to 0.039 inch to a thickness of 0.023 inch at the open end of the neck. In the sixth column of Table 1 are figures for  $h$  that are closely aligned with those obtained in practice. These figures are the result of using the approximate formula:

$$h = \frac{D - d_1}{2} \quad (6)$$

The values 0.830 to 1.670 inches for  $d_1$  were selected so that the material available for neck-

Fig. 5. Chart for determining neck height ( $h$ ) or initial diameter ( $d_1$ ) for various combinations of ( $D$ ) and ( $T$ ).



Note: For  $1/2$ -,  $3/4$ -, and  $1$ -inch diameter components the appropriate lines of the chart can be used as follows:

$D = 1$  inch,  $d_1 = 0.500$  inch, find  $h$ . Proceed along the 0.500-inch line from the  $d_1$  scale to the "D = 1 inch" line. From this point, the value of 0.255 inch can be read on the  $h$  scale.

For 2-inch diameter components the chart values are one-half the real values. To arrive at the correct value for either  $h$  or  $d_1$ , use the chart as previously described, then double the figure obtained.

For any other diameter within chart range:

Example— $D = 1 \frac{1}{2}$  inches,  $d_1 = 3/4$  inch, find  $h$ . Working with line "D = 1 inch," the value of  $d_1$  for the chart reading is

$$d_1 \times \frac{\text{Chart } D}{\text{Component } D} = 3/4 \times 1/1.5 = 1/2 \text{ inch}$$

Following the 0.500-inch line on the  $d_1$  scale to its intersection with line "D = 1 inch," an  $h$  value of 0.254 will be found. Then

$$\text{Actual } h = 0.254 \times \frac{\text{Component } D}{\text{Chart } D}$$

$$\text{Actual } h = 0.254 \times \frac{1.5}{1} = 0.381 \text{ inch}$$

forming decreased by an equal amount for each successive stage. It would seem, therefore, that height  $h$  of the neck should decrease by an equal amount. This was not the case, as the resulting value of  $h$  is affected by the stretching of the material during forming—the amount of stretching diminishing as  $d_1$  increases in value. The free end of the neck is uniform in each example, variations from the mean height being within the limits shown in Table 1.

Three other similar test series were run on components of approximately the same thickness but having diameter  $D$  of 1.002, 0.750, and 0.500 inch. Minimum permissible diameter for  $d_1$  to form the 1.002-inch diameter neck proved to be equal to 0.312  $D$ . For neck diameters of 0.750 and 0.500 inch the value of  $d_1$  was equal to 0.266  $D$  and 0.218  $D$ , respectively. In all these cases it was found that by substituting the approximate Formula (6) for Formula (4), values calculated for  $h$  would be reasonably close to those obtained in practice.

All data from the four test series have been collected and plotted on the chart in Fig. 5. The charts show the relationship between neck height and initial hole diameter in each case. Although there are second power terms in Formula (4), the lines on the chart are straight. In all probability, this is due to the counteracting effect of material stretching during extrusion which, as previously brought out, results in a lengthening of the neck.

The straight-line graphs suggest simple formulas that can be applied should the chart be unavailable. An equation for the " $D = 2$  inches" line that will yield the initial hole diameter  $d_1$  to obtain a certain neck height  $h$  is

$$d_1 = 2.107 - 2.27 h \quad (7)$$

To find the value of  $h$  when  $d_1$  is given, use the formula

$$h = 0.9287 - 0.441 d_1 \quad (8)$$

Similarly, the equations to line " $D = 1$  inch"

are

$$d_1 = 1.052 - 2.157 h \quad (9)$$

and

$$h = 0.488 - 0.464 d_1 \quad (10)$$

For line " $D = 3/4$  inch,"

$$d_1 = 0.803 - 2.23 h \quad (11)$$

and

$$h = 0.360 - 0.448 d_1 \quad (12)$$

Finally, for the line " $D = 1/2$  inch,"

$$d_1 = 0.524 - 2 h \quad (13)$$

and

$$h = 0.2625 - 0.5 d_1 \quad (14)$$

To apply these equations to other component diameters, the constant in each equation must be multiplied by the ratio

$$\frac{D_e}{D_s}$$

where  $D_e$  = required diameter of component;

$D_s$  = equation diameter.

As an example, a 1 1/2-inch diameter neck is required on a particular component and it is necessary to find the value of  $h$  when  $d_1$  is 0.75 inch. Using the modified " $D = 1$  inch" equation (10),

$$h = 0.488 \frac{D_e}{D_s} - 0.464 d_1$$

$$h = 0.488 \times \frac{3}{2} - 0.464 \times 0.75$$

$$h = 0.384 \text{ inch}$$

Table 2. Effect of Material Thickness on Neck Height

| No. | Die Dia.<br>$D$ (in.) | Punch Dia.<br>$d$ (in.) | Initial<br>Hole dia.<br>$d_1$ (in.) | Mat: Brinell<br>and Thickness<br>$T$ (in.) | Actual<br>Height<br>$h$ (in.) | Equation<br>giving value of<br>$h$ (in.) | Remarks                              |
|-----|-----------------------|-------------------------|-------------------------------------|--|-------------------------------|--|--------------------------------------|
| 55  | 1.002                 | 0.954                   | 3/8                                 | M.S. 0.024 115                             | 0.300                         | $\frac{0.0015}{0.002}$                   | Bad Fracture                         |
| 56  | "                     | 0.943                   | "                                   | " 0.0295 "                                 | 0.309                         | $\frac{0.002}{0.002}$                    | " "                                  |
| 57  | "                     | 0.925                   | "                                   | " 0.0385 "                                 | 0.314                         | $\frac{0.002}{0.002}$                    | Group 1<br>$h=0.9T+0.273$<br>Line 1  |
| 58  | "                     | 0.904                   | "                                   | " 0.049 "                                  | 0.322                         | $\frac{0.003}{0.003}$                    | " "                                  |
| 59  | "                     | 0.884                   | "                                   | " 0.059 "                                  | 0.332                         | $\frac{0.003}{0.003}$                    | " "                                  |
|     |                       |                         | 7/16                                |  |                               | $h=0.8T+0.255$                           |                                      |
| 60  | "                     | 0.954                   | 1/2                                 | " 0.024 "                                  | 0.247                         | $\frac{0.0025}{0.002}$                   | " "                                  |
| 61  | "                     | 0.935                   | "                                   | " 0.0335 "                                 | 0.256                         | $\frac{0.002}{0.002}$                    | Group 2<br>$h=0.7T+0.230$<br>Line 2  |
| 62  | "                     | 0.904                   | "                                   | " 0.049 "                                  | 0.265                         | $\frac{0.003}{0.003}$                    | " "                                  |
|     |                       |                         | 9/16                                |  |                               | $h=0.65T+0.205$                          |                                      |
| 63  | "                     | 0.978                   | 5/8                                 | T.P. 0.012 "                               | 0.187                         | $\frac{0.002}{0.002}$                    | Minimum $d_1$                        |
| 64  | "                     | 0.962                   | "                                   | " 0.020 "                                  | 0.195                         | $\frac{0.002}{0.002}$                    | Slight Fracture                      |
| 65  | "                     | 0.942                   | "                                   | M.S. 0.030 "                               | 0.197                         | $\frac{0.002}{0.002}$                    | No "                                 |
| 66  | "                     | 0.932                   | "                                   | " 0.035 "                                  | 0.202                         | $\frac{0.001}{0.001}$                    | Group 3<br>$h=0.6T+0.179$<br>Line 3  |
| 67  | "                     | 0.908                   | "                                   | " 0.047 "                                  | 0.206                         | $\frac{0.002}{0.002}$                    | " "                                  |
|     |                       |                         | 11/16                               |  |                               | $h=0.53T+0.153$                          |                                      |
| 68  | "                     | 0.982                   | 3/4                                 | T.P. 0.010 "                               | 0.131                         | $\frac{0.002}{0.002}$                    | " "                                  |
| 69  | "                     | 0.954                   | "                                   | M.S. 0.024 "                               | 0.133                         | $\frac{0.001}{0.001}$                    | " "                                  |
| 70  | "                     | 0.935                   | "                                   | " 0.0335 "                                 | 0.141                         | $\frac{0.002}{0.002}$                    | Group 4<br>$h=0.46T+0.126$<br>Line 4 |
| 71  | "                     | 0.904                   | "                                   | " 0.049 "                                  | 0.149                         | $\frac{0.002}{0.002}$                    | " "                                  |
|     |                       |                         | 13/16                               |  |                               | $h=0.35T+0.103$                          |                                      |
|     |                       |                         | 15/16                               |  |                               | $h=0.2625-0.5 d_1$                       |                                      |

M.S. = Mild steel. T.P. = Tinplate.

### Effect of Material Thickness on Extruded Holes

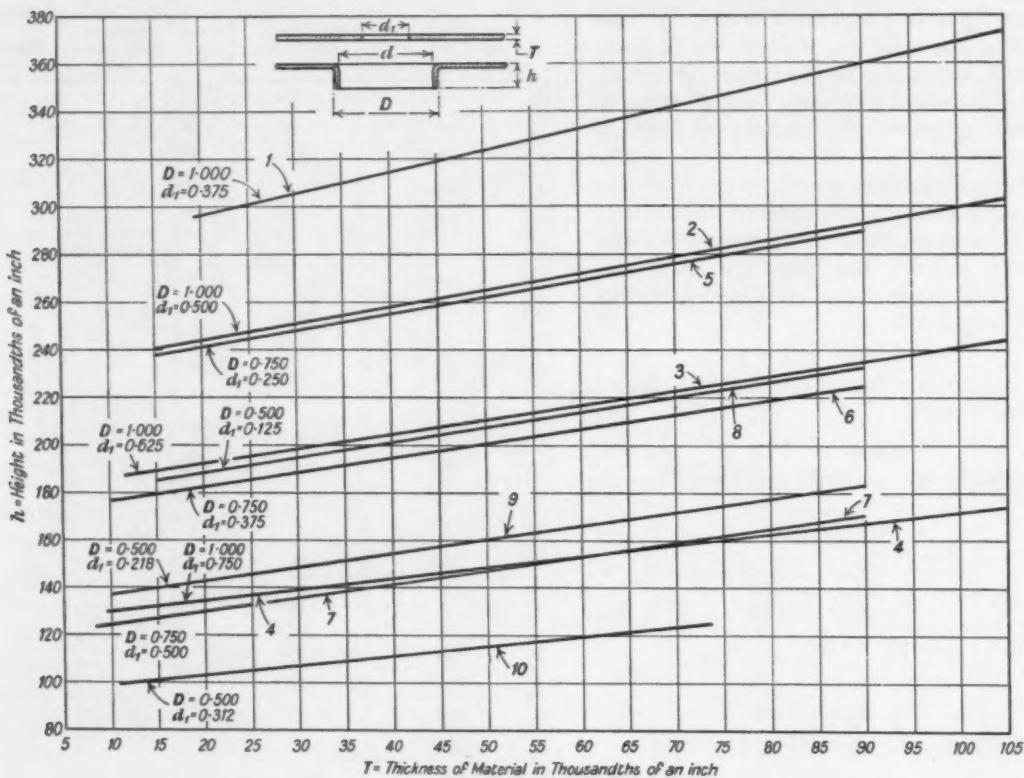
In the cases presented so far, the material thickness has ranged between 0.030 and 0.040 inch. The question arises as to what degree the results would be affected by changes in this factor. Data in this connection have been compiled from tests on components of thicknesses ranging from 0.010 to 0.062 inch. Tinplate was used for the 0.010- and 0.012-inch thick material. All test information was consolidated and listed in the manner shown in Table 2.

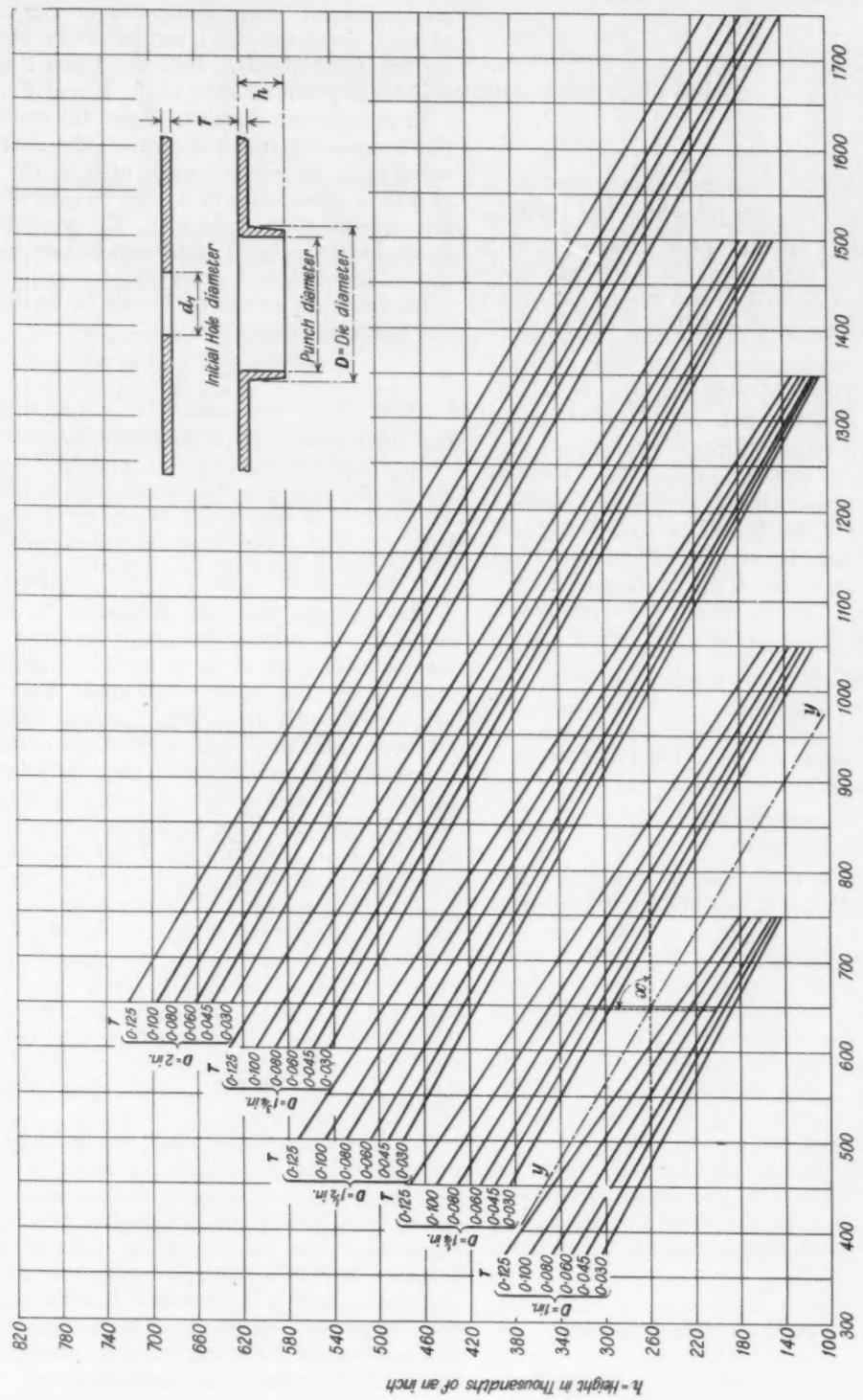
All components having a neck diameter of 1.002 inches are listed in the table. They are divided into four groups in which the initial hole diameter  $d_1$  has the values  $3/8$ ,  $1/2$ ,  $5/8$ , and  $3/4$  inch, with intermediate diameters of  $7/16$ ,  $9/16$ , and  $11/16$  inch. Tests of this same type were also run on parts with neck diameters of 0.500 and 0.750 inch.

On plotting the values of  $T$  and  $h$  from each individual test group, straight sloping lines were obtained as indicated on the chart in Fig. 6. All values lie on, or very near to, the straight lines. There is no reason to suppose that any line would deviate from the indicated path even for a considerable increase in range over that covered by the tests. When using the chart for material thicknesses exceeding those already considered, good judgment must be exercised regarding the maximum material thickness in relation to the neck diameter.

As an example, a component of 0.080-inch thick mild steel is to have an extruded hole with a neck diameter of 1.000 inch. With an initial hole  $d_1$  of 0.500 inch, the value of  $h$  can be determined from the chart in Fig. 6. Enter the material thickness scale at the point representing 0.080 inch and follow this line to its intersection with Line 2. Going to the left, the value 0.286 can be read on the height scale.

Fig. 6. Chart for determining neck height ( $h$ ) for various combinations of ( $D$ ) and ( $d_1$ ).





**Fig. 7. Comprehensive chart for determining neck height ( $h$ ) or initial hole height ( $T$ ) for various combinations of ( $D$ ) and ( $d_i$ ).**

Equations for the lines in Fig. 6 that will be helpful if the chart is unavailable are as follows:

|          |                       |
|----------|-----------------------|
| Line 1.  | $h = 0.91 T + 0.279$  |
| Line 2.  | $h = 0.7 T + 0.230$   |
| Line 3.  | $h = 0.6 T + 0.179$   |
| Line 4.  | $h = 0.46 T + 0.126$  |
| Line 5.  | $h = 0.7 T + 0.227$   |
| Line 6.  | $h = 0.61 T + 0.170$  |
| Line 7.  | $h = 0.56 T + 0.119$  |
| Line 8.  | $h = 0.625 T + 0.176$ |
| Line 9.  | $h = 0.575 T + 0.133$ |
| Line 10. | $h = 0.42 T + 0.094$  |

An example demonstrating the use of these equations might be this:  $D$  is 1.000 inch,  $d_1$  is 0.625 inch, and the material is 0.100-inch thick mild steel. It is desired to find the height of the neck that will be produced. Using the equation for Line 3,

$$\begin{aligned} h &= 0.6 T + 0.179 \\ h &= 0.6 \times 0.100 + 0.179 \\ h &= 0.239 \text{ inch} \end{aligned}$$

By using the chart directly, the approximate value 0.242 inch will be obtained.

Investigation has shown that for an intermediate value of  $d_1$ —such as 7/16 inch in Table 2, which is the mean between the 3/8 and 1/2 inch values of  $d_1$ —an equation can be derived by taking the mean of the equations corresponding to Groups 1 and 2. For instance for Group 1:

$$D = 1.000, d_1 = 0.375, h = 0.91 T + 0.279$$

for Group 2:

$$\begin{aligned} D &= 1.000, d_1 = 0.500, h = 0.70 T + 0.230 \\ \text{by adding, we get} & \quad 2h = 1.61 T + 0.509 \end{aligned}$$

Therefore, when

$$\begin{aligned} D &= 1.000 \text{ and } d_1 = 0.4375 \\ \text{then } h &= 0.805 T + 0.2545 \end{aligned}$$

The value of  $d_1$  to be used in obtaining a specific neck height can be ascertained by referring to Fig. 6. In a case where  $D$  is 1.000 inch,  $T$  is 0.035 inch, and height  $h$  of the neck is to be 0.225 inch, it is necessary to determine the initial hole diameter  $d_1$ . Referring to the chart, the intersection of the "h" line, 0.225 inch, with the "T" line, 0.035 inch, lies approximately midway between Line 2 (representing  $d_1 = 0.500$  inch) and Line 3 (representing  $d_1 = 0.625$  inch). Thus, the required value of  $d_1$  falls midway between 1/2 and 5/8 inch—or 9/16 inch. It can be seen that the chart will give results dependent upon the location of the point of intersection between any two sloping lines in the appropriate "D" groups.

#### Expanded Data on Hole Extrusion

Investigation into the effect of material thickness on neck height was carried further with the testing of four additional series of components.

These have neck diameters of 1 1/4, 1 1/2, 1 3/4, and 2 inches. From the information collected, the comprehensive chart illustrated in Fig. 7 was plotted. Using the chart, results can be obtained for any neck diameter between 1 and 2 inches, and for any combination of  $d_1$ ,  $h$ , and  $T$  values.

In cases where diameter  $D$  and thickness  $T$  of the component are as shown on the chart, the value of  $d_1$  for a given value of  $h$ , or the value of  $h$  for a given value of  $d_1$ , can be read directly. For intermediate values of  $T$ , proportionate points between the "T" lines can be selected and the values of  $d_1$  or  $h$  observed.

Intermediate values of  $D$  can be handled in the following way.

$$\begin{aligned} \text{If } & \quad D = 1.125, \\ & \quad T = 0.060, \text{ and} \\ & \quad h = 0.260, \end{aligned}$$

find the diameter  $d_1$  of the initial hole.

$$\text{For } D = 1.000, h = 0.260; T = 0.060; d_1 = 0.525$$

$$\text{For } D = 1.250, h = 0.260; T = 0.060; d_1 = 0.770$$

1.295

Therefore, for

$$D = 1.125, h = 0.260; T = 0.060; d_1 = 0.647$$

This example has been presented to demonstrate the underlying principles involved when seeking values for  $d_1$  or  $h$  for an intermediate value of  $D$ . The same result could have been obtained directly from Fig. 7 in the following manner: Enter the height scale at the point representing 0.260 inch. Note the horizontal distance between the intersection of this line with the "T = 0.060" inch lines in groups "D = 1 inch" and "D = 1 1/4 inches." Bisect the distance noted and read downward to the "d<sub>1</sub>" scale for a value of 0.647 inch. This procedure is represented by the broken lines  $x$  on the chart.

Using the same data, the process can be reversed to find the value of  $h$ . Enter the chart at the point  $d_1 = 0.647$  inch. Note the vertical distance between the intersection of this line with the "T = 0.060" inch lines in groups "D = 1 inch" and "D = 1 1/4 inches." Bisect this line and read 0.260 inch on the "h" scale.

The usefulness of this chart can be expanded still further. As an example: A series of 0.060-inch thick parts are required with a neck diameter of 1.125 inches, but differing in neck height. An auxiliary line can be added to the chart by bisecting, in two or more places, the vertical distance between the "T = 0.060" inch lines in the two "D" groups concerned. All the midpoints can then be connected to form line  $y-y$  as illustrated. This line fulfills the same functions as any other graph line, giving direct values of  $d_1$  or  $h$  when  $D$  is 1.125 inches and  $T$  is 0.060 inch.

# Questions and Answers

A service to readers who have questions pertaining to the metal-working and machine-building industries

## Optimum Grinding Wheel Speed

I. S. S.—Is the maximum safe speed shown on the grinding wheel blotter always the most efficient grinding speed?

Answered by **GUS WICKSTROM**  
Norton Co., Worcester, Mass.

No, it is not. The maximum speed shown is based on the strength of the wheel—not on its cutting efficiency. The best speed may sometimes be considerably lower. For example, in the case of special metals and alloys such as titanium and high vanadium type high-speed steels, the most efficient grinding speed may be as low as 3000 surface feet per minute.

## Soldering Stainless Steel

P. B. S.—We have recently placed in service a number of gravity deckers equipped with stainless-steel face wires and cloth. These deckers are operating on groundwood having a pH of approximately 4.1. The lap seam securing the stainless-steel cloth was made with 50-50 tin-lead solder and all joints made with this solder show distinct evidence of corrosion after approximately two months of service. In some cases, the seam is actually deteriorating to the point where it will lift and has to be repaired.

We do not as yet know whether the source of trouble is mechanical or chemical. The stainless steel employed is Type 316 but we do not know whether it was active or passive.

Answered by **The International Nickel Co., Inc.**  
New York City

Stainless steel is readily soldered using a 50-50 lead-tin solder. Sound joints can be produced by use of special soldering fluxes. Zinc-chloride or cut acid is employed as a flux using the 50-50 solder and will give fair results. However, for stronger joints, as pointed out above, special soldering fluxes are desirable.

It is important that after applying the soldering flux and solder, the flux should be thoroughly removed by washing. If the flux is not removed, the metal will corrode. If the joint is of such a nature that washing on both sides is impossible, such as would be the case with a lap joint facing cloth, it is sometimes customary to first tin the stainless steel using a strong flux and then wash it. The joint is then assembled and finished using a flux as nearly neutral as possible.

If the pulp stock contains a high percentage of alum and has a low pH, it is possible that the lead-tin solder may be cathodic to the stainless-steel facing cloth, and galvanic action can occur, resulting in corrosion of the stainless-steel cloth adjacent to the soldered joint.

Another important factor is the work-hardening nature of stainless steel. If a couch roll operates on the decker and flexing of the facing cloth occurs at the edge of the soldered joint, the stainless-steel facing cloth will crack and fail prematurely.

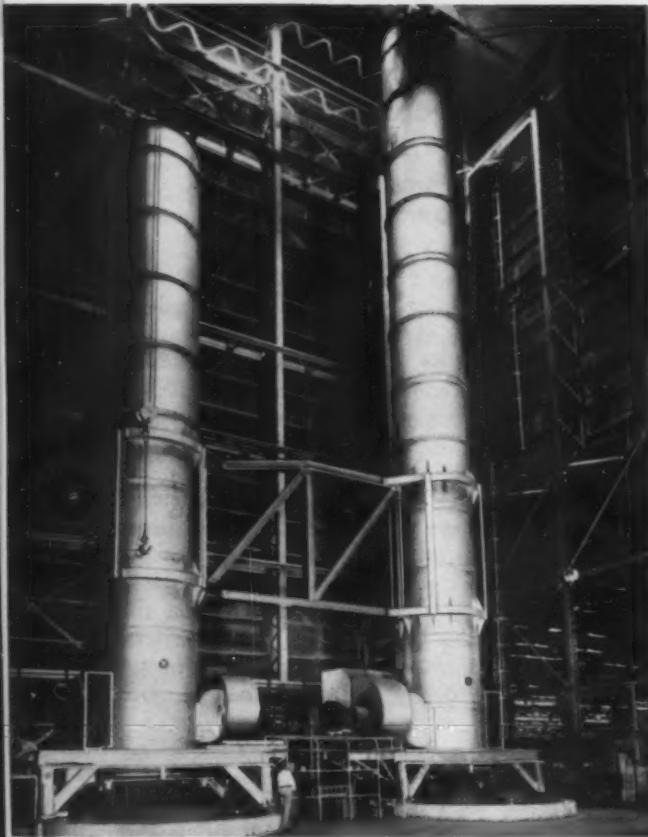
## Purchaser Acting as Broker

A.C.M.—Can a purchaser act as both purchaser and broker and thus obtain lower prices by deducting his broker fees from the regular purchase price?

Answered by **LEO T. PARKER**  
Attorney at Law, Cincinnati, Ohio

No. In Rathke vs. Yakima [192 Pac. (2d) 349] a purchase contract was signed by the purchaser and seller. The contract provided that the purchaser may act as a broker.

The higher court held all contracts relating to the transaction unenforceable and ruled: "We are also of the opinion that the Robinson-Patman Act [15 U.S.C.A. 13 (c)] absolutely prohibits the paying, or granting, or receiving, or accepting anything of value as a commission, brokerage, or other compensation, or any allowance or discount in lieu thereof, from seller to buyer."

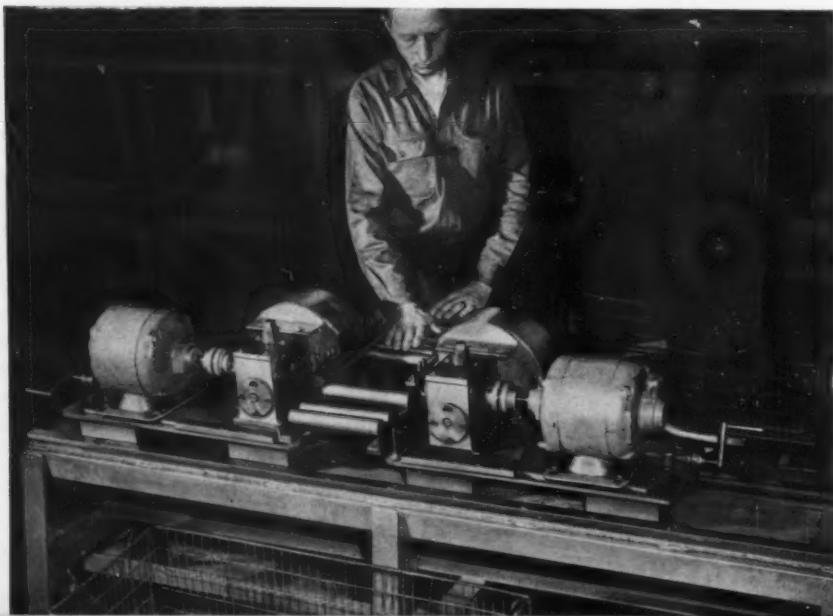


## IN SHOPS AROUND THE COUNTRY

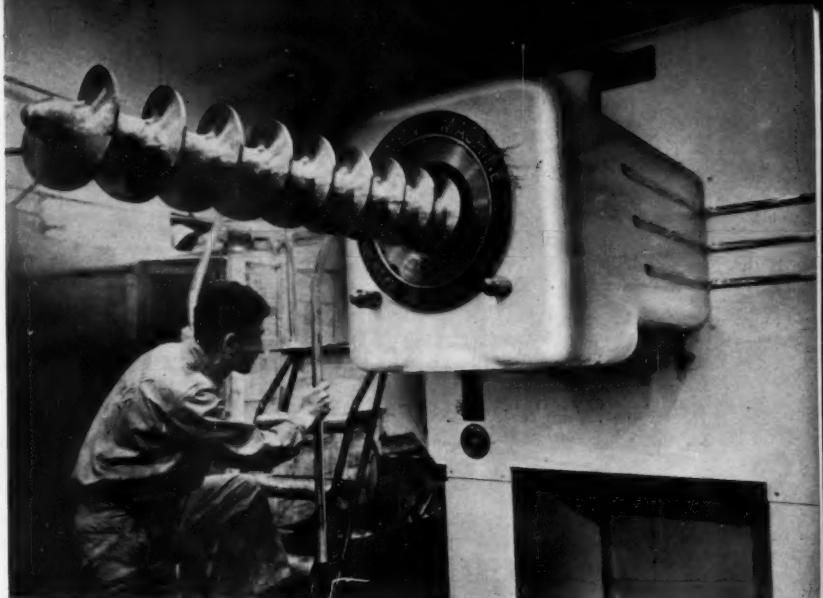
Camera highlights of some interesting operations performed in various metalworking plants throughout the nation

**HOT DUET**—Extrusions at Harvey Aluminum, Torrance, Calif., are solution heated-treated in these two Westinghouse controlled-temperature electric furnaces. Furnace on right, 110 feet high and 7 feet in diameter, is said to be tallest of its type in the country. Companion furnace is 70 feet high. Following heating cycle, extrusions discharge into huge vertical underground quenching tanks.

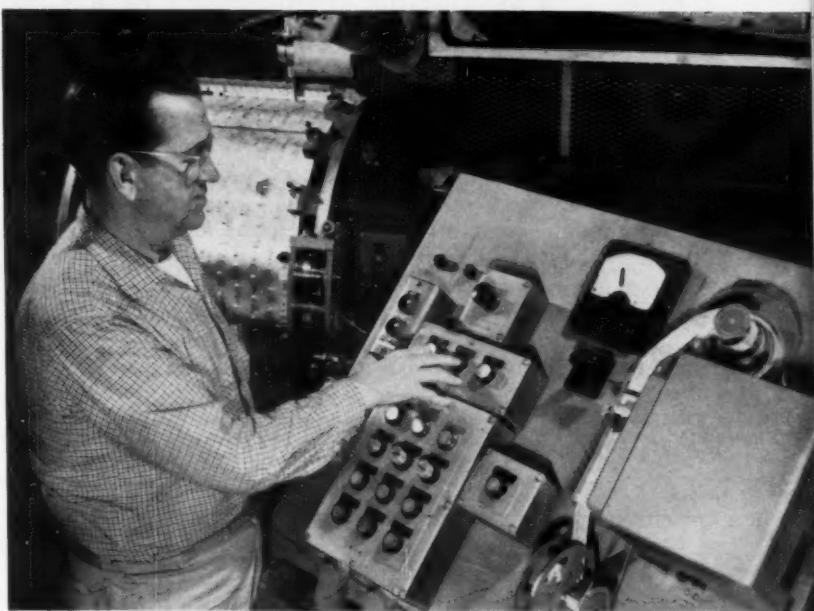
**GETTING THE BRUSH-OFF**—Ends of copper and brass tubes are deburred on this shop-built machine, at Calumet & Hecla's Wolverine Tube Division, Detroit, Mich. Tubes are pushed forward between opposed assemblies, each consisting of a pair of brushes, motor, and right-angle gear drive. As tubes pass brushes, they rotate automatically. Assemblies are mounted on movable bases to accommodate varying lengths of work-pieces.



**MACARONI MAKER**—An inspector checks water temperature during final testing of a vacuumized macaroni screw press, at the Clermont Machine Co., Brooklyn, N. Y. Heart of the machine is a large stainless-steel cast screw, 60 inches long with 6-inch diameter flights, supplied by Empire Steel Castings, Inc., Reading, Pa. Replacing one made from carbon-steel bar stock, the stainless-steel cast screw cut material and labor costs by 50 per cent and resists corrosive and pitting action of the food enzymes.



**PLAYER-PIANO WELDING**—Insert a roll of tape, set the controls, and this machine automatically welds in less than one and one-half hours as many as 1600 spots on a jet-engine part, at General Electric's Everett, Mass., plant. Welding of cylindrical parts has been slashed to about one-fourth of time of former manual operation. The machine has been designed by GE's Small Aircraft Engine Department.



**SPRINGTIME IN CHICAGO**—Inspector at left checks for free-height of a heavy-duty spring at the Chicago Heights, Ill., plant of Alco Products. Other inspector performs a Magnaglo test on a lighter spring. Plant produces springs for railroad freight and passenger-car trucks, diesel locomotives, as well as for industrial machinery.





# MACHINERY'S PROBLEM CLINIC

Mathematical problems in shop work and tool design submitted by readers of MACHINERY

Edited by HENRY H. RYFFEL

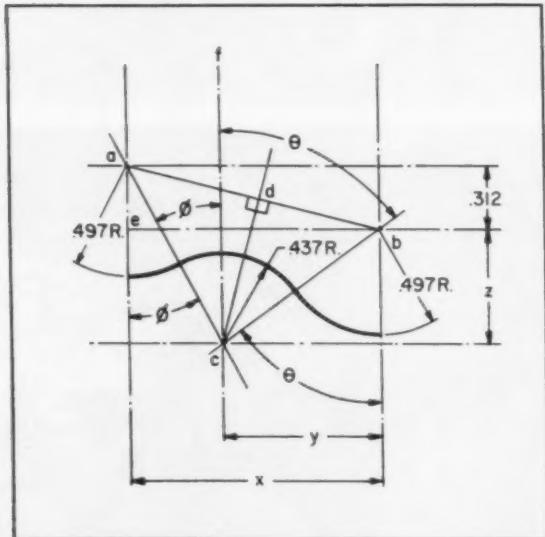
## Calculating Dimensions of a Clamp-Forming Die

BERTON J. LEAVITT  
Cushman Motor Works Inc.

The metal part shown in the accompanying illustration is formed in two dies; the first die makes the reverse bend; the second die is used to finish-form the part to the required shape indicated by the heavy line in the diagram.

Previous experience indicated that 172 degrees of arc are needed between points *a* and *b* and that for functional purposes point *a* should be 0.312 inch above *b* with radii of 0.437 and 0.497 inch, as shown.

To construct the dies it is necessary to know  $\theta$ ,  $\phi$ ,  $x$ ,  $y$ , and  $z$ .



Layout of metal clamp for which  $\theta$ ,  $\phi$ ,  $x$ ,  $y$ , and  $z$  must be calculated.

### Solutions:

1. Since a total of 172 degrees of arc is required, reference to the diagram will show that

$$2\theta + 2\phi = 172^\circ \text{ or} \\ \theta + \phi = 86^\circ = \text{angle } acb$$

2. Since *ac* and *cb* are of equal length ( $0.497 + 0.437 = 0.934$ ), triangle *acb* is an isosceles triangle and *cd* is the perpendicular bisector of *ab* and also the bisector of angle *acb*

One-half of angle *acb* is angle *acd*. Therefore,

$$\text{Angle } acd = \frac{86^\circ}{2} = 43^\circ$$

$$3. ad = ac \times \sin 43^\circ \\ = (0.437 + 0.497) \times 0.68200 \\ = 0.934 \times 0.68200 \\ = 0.63699$$

$$4. ab = 2 \times ad \\ = 2 \times 0.63699 \\ = 1.27398$$

5. Angle *abe* = angle *dcf*

$$\sin abe = \frac{0.312}{ab} \\ = \frac{0.312}{1.27398} \\ = 0.24480,$$

so that angles *abe* and *dcf* =  $14^\circ 10.6'$

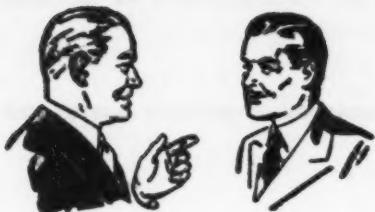
$$6. \phi = 43^\circ - 14^\circ 10.6' \\ = 28^\circ 49.4'$$

$$7. \theta = 43^\circ + 14^\circ 10.6' \\ = 57^\circ 10.6'$$

$$8. x = ab \times \cos 14^\circ 10.6' \\ = 1.27398 \times 0.96955 \\ = 1.235$$

$$9. y = cb \times \sin 57^\circ 10.6' \\ = 0.934 \times 0.84035 \\ = 0.785$$

$$10. z = cb \times \cos 57^\circ 10.6' \\ = 0.934 \times 0.54205 \\ = 0.506$$



# Talking With Sales Managers

By **BERNARD LESTER**  
Management Consulting Engineer

## Too Many Volts—Too Few Amperes

WORKING night shift on electrical test long ago brought rewards. One was to have a severe but quaint old German as partner and boss. He tested the assembled motors while we adjusted the rheostat of the ancient dynamo that supplied the current. Often he would lift up his gaze and ardently implore, "Ze wolts is bad—hold um, hold um."

There is one sales manager who has recently learned the need for current in addition to voltage and control. Well over a year ago, with a fine reputation as a commodity merchandiser, he was called to head up sales for an industrial equipment builder.

He defined objectives, set goals, and added several high-voltage salesmen. Total sales proved quite disappointing at first in spite of ample sales drive. Today this sales manager admits, "Last fall our program was based on getting action—order closing. When I came here I found everything moving too slowly. We had the volts but discovered later we did not have the power. During late spring we worked out a new sales program—we call it Depth Selling. It is designed to correct our mistaken notion of equipment buying." When he first arrived, like many others, this sales manager proclaimed, "A good salesman can sell anything." He clung to the theory that the driving force of salesmanship by itself could reach any of a thousand targets. Why bother with value analysis of product and process? Benefits are to parade rather than appraise and ratify.

But now this sales manager is aware of the positive transformation that quietly continues to take place in purchasing. Decisions are being made less on emotion and more on evidence and reason. Persuasion is more than welcome if loaded with reason. One manager of purchases for a big industry concern asks this pointed question about each supplier's sales engineer

"Does he give service before he gets the order as well as after?"

Two operations are in progress to prepare for the Depth Selling program effective this fall.

One consists of a summer training program for field sales engineers. This does not feature salesmanship but rather technical intelligence and engineering practice. It itemizes:

Economic questions that motivate buying process, production, and maintenance parts.

Calculating the costs and benefits of replacement.

The proper application of equipment.

Preparing an engineering proposal.

The other part of the Depth Selling program concerns headquarters sales, service, and promotion. It consists of a penetrating analysis of ways and means to add substance and strength to the work of field sales engineers. Insufficient technical information upon equipment and its application is made complete. Sales tools of various sorts are sharpened. Samples and models for use in selling are provided. Each field sales engineer now subscribes to trade and technical journals which he is required to review. A system is set up to circulate engineering data upon applications made among all sales engineers. Trade paper advertising, that had in the past fallen into an obscure rut, is being revised to be alive and informative.

Implementing this Depth Selling program is based on a simple principle we so often neglect—individual growth. Buildings and the like cannot develop stronger foundations, but sales engineers can. Men don't become engineers without abundant on-the-job technical study. Every sales manager can profit by appraising personnel and systems to make sure there is a proper relationship between voltage and current—that each is controlled so as to produce maximum power.

# LATEST DEVELOPMENTS

Machine tools, unit mechanisms, machine parts and

## Press with Two Bolsters Provides Quick Die Change

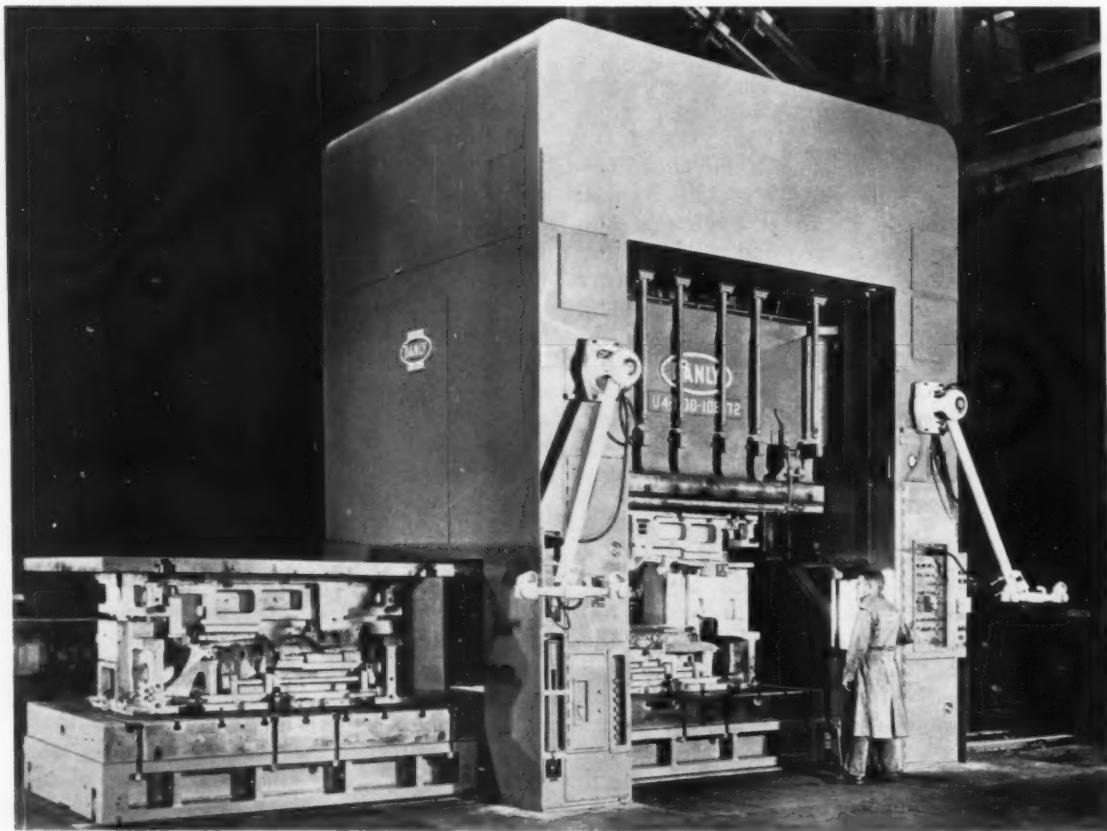
Quick die-change presses introduced by Danly Machine Specialties, Inc., Chicago, Ill., feature two moving bolsters. While one bolster is over the bed and in production, the idle bolster, shunted to one side of the press, can be set up with the dies for another job. In a matter of minutes, the operative bolster can be moved to the opposite side of the press and the idle bolster moved over the bed, thus eliminating lengthy production delays for changing dies. The quick die-

change principle can be incorporated in both overdrive and underdrive presses of single, double, or triple action.

Bolsters are mounted on power-driven carriers which move over rails on the floor level. The uprights of the press are designed with side openings large enough to afford passage to the carrier, bolster, and die assemblies. Since dies are not removed through either the front or the rear, presses can be installed closer together, and mechanical handling

equipment can be of a more permanent nature, since it does not have to be removed when setting up the dies. Because setup time is greatly reduced, the press becomes more efficient, especially on short runs.

Movement of the bolsters is directed from a push-button panel. They can move at the same time or independently of each other. When moving into working position, the carrier comes against a positive stop. Wheels on the bottom of the carrier are then over



Danly 500-ton single-action press has two bolsters for quick die change

IN

# SHOP EQUIPMENT

**material-handling appliances recently introduced**

Edited by FREEMAN C. DUSTIN

hydraulic cylinders which are retracted, permitting the carrier to be positioned accurately over keys and to rest solidly on the press bed. An adapter plate, fastened to the upper half of the die is clamped automatically to the press slide. (Double-action presses have adapter plates for both the inner and outer slides.)

After a die has been tried out and its shut height is known, a motor-driven positioner brings the slide to correct setting. A separate micro-inching drive, independent of the flywheel, permits a die to be tried out at slow speed with full power.

Circle Item 101 on postcard, page 255

## Hydrabrasive Precision Surface Grinder

The Abrasive Machine Tool Co., East Providence, R.I., has brought out a line of Hydrabrasive precision surface grinders incorporating many new features. The line includes three sizes—designated Nos. 824, 1218, and 1224—which have tables with work surfaces 8 by 24 inches, 12 by 18 inches, and 12 by 24 inches. The standard height under a 12-inch wheel to top of table is 12 inches but the machines can be built to provide for a work height of 18 inches under the wheel. The table of the 24-inch model can also be safely extended to a length of 30 inches without sacrificing strength or accuracy.

Cool-running spindles equipped with anti-friction pre-loaded bearings with lifetime sealed lubrication are designed for trouble-free operation. The spindles are precision-ground from special steel and are powered by special "soft"

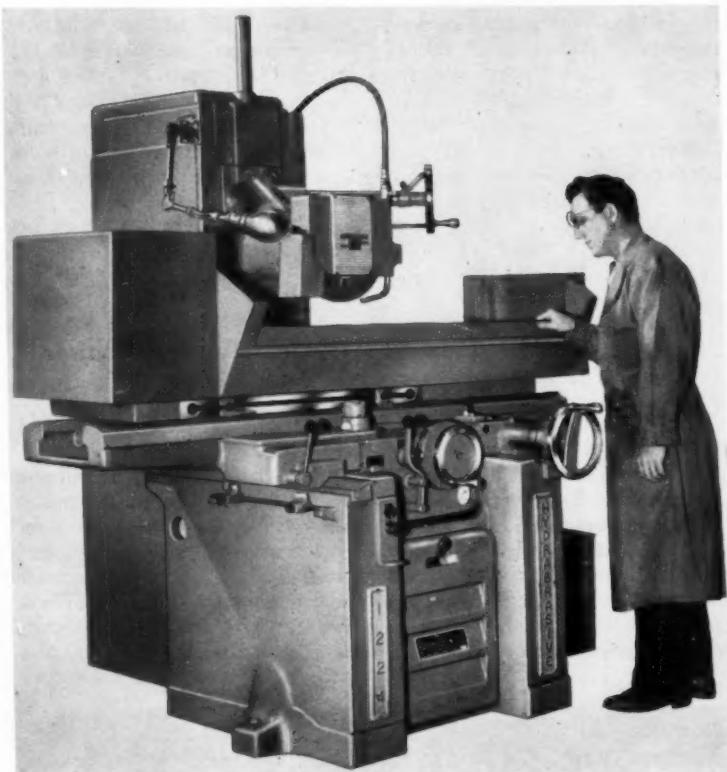
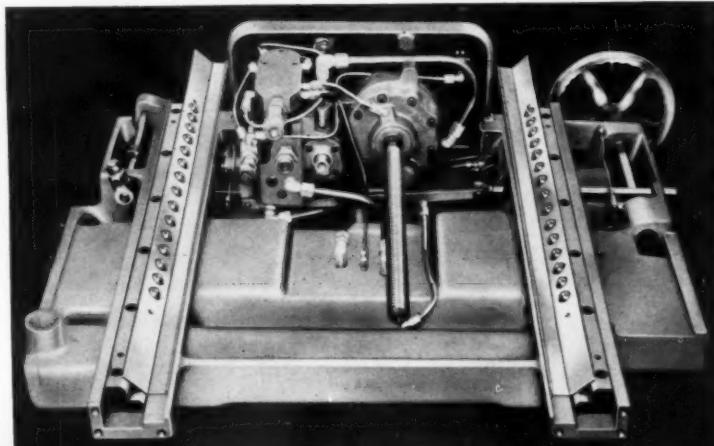


Fig. 1. (Above) Hydrabrasive precision surface grinder announced by Abrasive Machine Tool Co.

Fig. 2. Saddle of machine illustrated in Fig. 1 turned upside-down to show precision ground cross-feed screw and ball bearing ways



running motors. All components are Dynetically balanced after assembly. The head and spindle assembly is balanced on the elevating screw to eliminate binding on the column ways.

The table is actuated by two hydraulic cylinder rams with oil cushions to absorb all shock at the end of each stroke. As each ram is under pressure only half of the time, the heating usually associated with hydraulically operated systems is minimized. The low-pressure hydraulic system, operating at 200 psi, is of simple design, compact, and easily removed for inspection or maintenance. Normal temperature rise in the hydraulic system is only 20 degrees F. The coolant system is located outside the machine, eliminating heat transfer from that source.

The newly designed Hydrabra-

sive cross-feed is an outstanding feature of these machines. A precision-ground cross-feed screw with backlash eliminator and ball bearing saddle ways provides for highly accurate transverse saddle adjustment. The saddle moves on 3/4-inch steel pre-loaded ball bearings on hardened steel square ways arranged as shown in Fig. 2. The hydraulic motor turns the screw for rapid transverse movement of the saddle when dressing the wheel.

All controls on the Hydrabra-sive machines are conveniently grouped for smooth operation and are mechanically interlocked for positive safety. The elevating handwheel is located on the head in a convenient position, as illustrated in Fig. 1, to eliminate tiresome crouching when lining up work.

Circle Item 102 on postcard, page 255

### Bath Radial Draw Former with Yield-Tension Monitor for Use in Producing Guided Missiles

A 25-ton radial draw former equipped to prevent metal fatigue in parts produced for guided missiles has been built by the Cyril Bath Co., Solon, Ohio, and delivered to the Army Ballistic Missile Agency, Huntsville, Ala. This machine, Fig. 1, will be used in the production of the Jupiter guided missile. It is one of the

first machines to be equipped with the yield-tension monitor, Fig. 2, which electronically determines the yield point of the material to be formed and then continuously controls the tension forces imposed on the material itself during the forming operation. With this forming control, the part to be produced by the

machine is itself used as a test bar to determine its own yield strength and to control the force used in forming it to the required shape.

The newly developed monitor equipment will also be used by the Convair Division, General Dynamics Corporation, manufacturers of the Golden Arrow, 600-mpm jet airliner, as a part of the giant draw former now under construction at the Bath plant.

The radial draw former will simultaneously stretch-form and compression-form extruded parts, sheets, and strips to the desired contours, virtually eliminating over-stretching or breakage in parts made of such expensive metals as titanium, magnesium, stainless steel, aluminum, and their relative alloys.

The tension control panel, shown at right, Fig. 2, houses electronic units for amplifying and correlating tension and elongation signals in the yield-tension monitor which electronically determines the yield point of material to be formed by the radial draw former and then continuously controls the tension forces imposed on the material during the forming operation. The recording tension meter at the top of the cabinet provides a permanent, charted record of tension maintained on the part throughout the forming cycle.

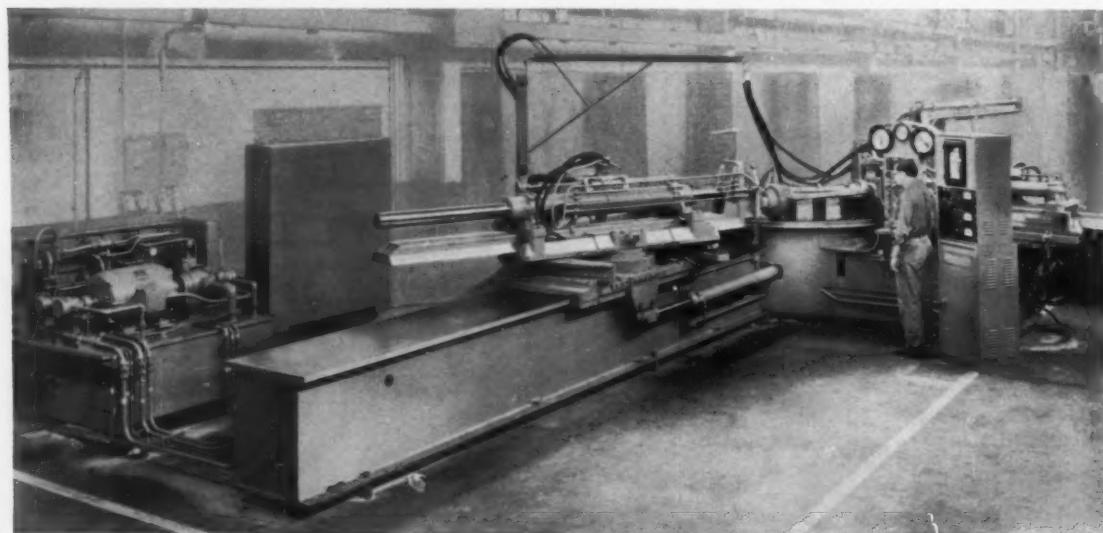


Fig. 1. Bath 25-ton radial draw former equipped with yield-tension monitor

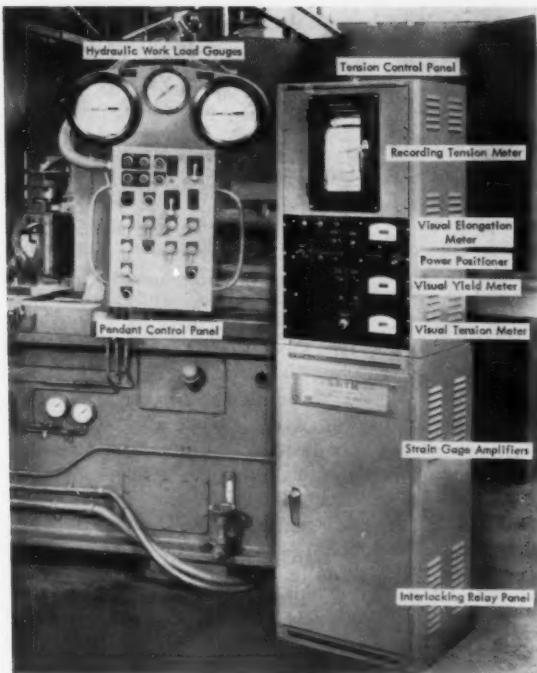


Fig. 2. Control panels of Cyril Bath radial draw-forming equipment shown in Fig. 1

The machine is provided with position control devices which will stop the table automatically in the same position at the start and finish of each part. Limit switches can be furnished for relay operation to provide step changes in work tension during the work cycle, or potentiometers can be arranged to provide a continuous sweep in the change of work tension even where working with pieces varying in cross-section and tapering from one end to the other. The entire unit is made up of standard items.

**Circle Item 103 on postcard, page 255**

#### **Oilgear Heavy-Duty Fluid Power Cylinders**

A new line of heavy-duty, 3500-psi, standard and large ram, double-acting "Custom-Quality" cylinders designed for dependable, trouble-free, leakproof, long life operation—even under the most severe operating conditions—has been announced by the Oilgear Co., Milwaukee, Wis. These cylinders are thick-walled, seamless steel, precision bored, honed, polished, and carefully gaged for

accuracy of roundness, straightness, and size to insure a minimum of friction, slip, and wear.

Eight basic sizes ranging from 2 to 8 inches are available with either standard- or large-diameter rams. The length of stroke varies from 36 inches up to 158 inches.

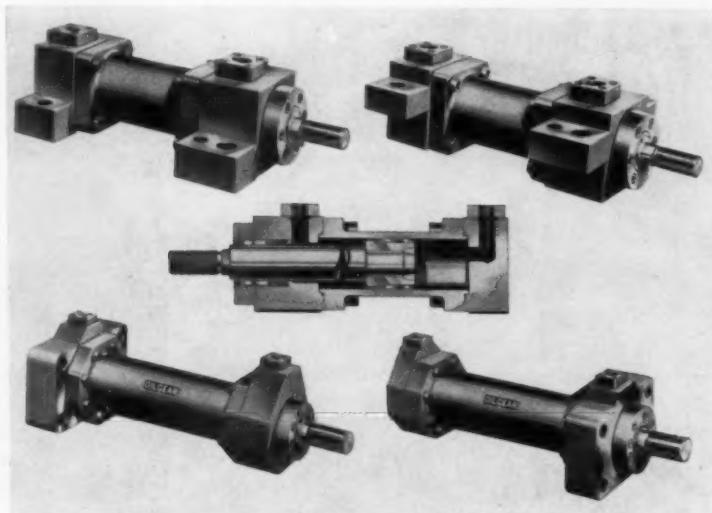
**Circle Item 104 on postcard, page 255**



Wadell automatic precision boring machine with positioning index-table

#### **Automatic Precision Boring Machine**

The Wadell Equipment Co., Clark, N. J., has announced an automatic vertical precision boring machine, complete with positioning index-table. Turning, chamfering, and other operations



"Custom-Quality" heavy-duty fluid power cylinders announced by Oilgear Co.

can be performed on this machine with multiple cutter-heads.

The vertical design affords full use of two spindles, thus providing two finished pieces per cycle. The illustration shows the machine arranged for boring electric motor end-shields. Bore diameters are held to size within limits of 0.0003 inch and concentric within 0.001 inch. Operation is automatic except for loading and unloading.

**Circle Item 105 on postcard, page 255**

### Controlled-Atmosphere Tempering Units

Two controlled-atmosphere tempering units, with and without a cooling chamber, have been added to the "Clean-Line" heat-treating units built by the Eclipse Fuel Engineering Co., Rockford, Ill. Both units are designed with standard work heights, so that they can readily be made part of an integrated heat-treating system with other Eclipse "Clean Line" units.

Tempering operations can be maintained at a maximum tem-

perature of 1400 degrees F. with work manually loaded into the heating chamber from a roller platform.

Units equipped with a cooling chamber pass the work straight through, while those without the chamber use the same door for loading and unloading. Both furnaces have a work area 24 inches wide, 36 inches long, and 18 inches high. Sealed alloy radiant tubes in the gas burners having a maximum input of 500,000 Btu per hour maintain temperatures evenly at all times.

Both types of tempering furnaces are provided with a complete instrument panel that includes a strip chart controller, excess temperature cut-off, indicating instrument, motor starters, and switches wired to a terminal strip. Two thermocouples (with Inconel protection tubes and lead wire, one for temperature control and the other for excess temperature safety) are also provided. An endothermic flow gage with built-in adjusting valves is mounted and piped to the furnace.

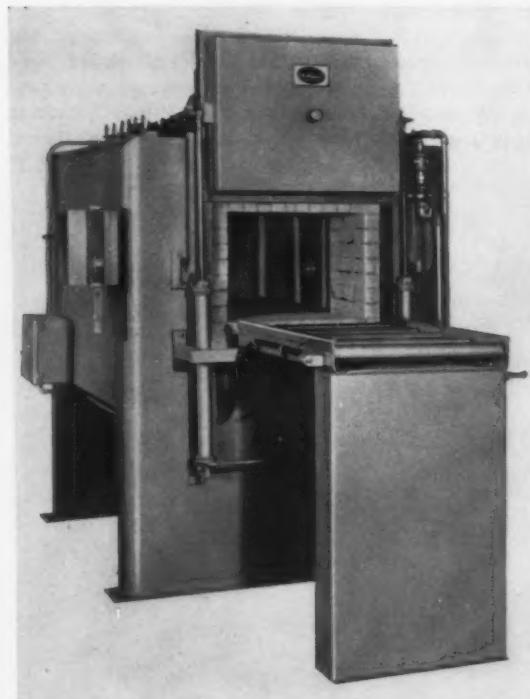
**Circle Item 106 on postcard, page 255**

### Natco Machines for Processing Valve Rocker Arms

The National Automatic Tool Co., Inc., Richmond, Ind., has brought out two multiple-spindle drilling machines which complete 756 valve rocker arms per hour when operating at 100 per cent efficiency. This combination of equipment consists of a vertical Holesteel machine and a three-way Natco drill.

The vertical Holesteel machine, Fig. 1, has sixteen spindles and a six-position automatic indexing fixture. Four parts are clamped hydraulically at each position as the major hole in each part is core-drilled, rough-reamed and semi-finish reamed. The parts are automatically ejected from this machine.

The three-way type drill, Fig. 2, consists of a vertical head with twelve spindles and two angular heads with four spindles each. The four-position automatic indexing table holds four parts at each position. Two holes are drilled



Eclipse "in-and-out" controlled-atmosphere tempering or drawing unit added to the "Clean-Line"

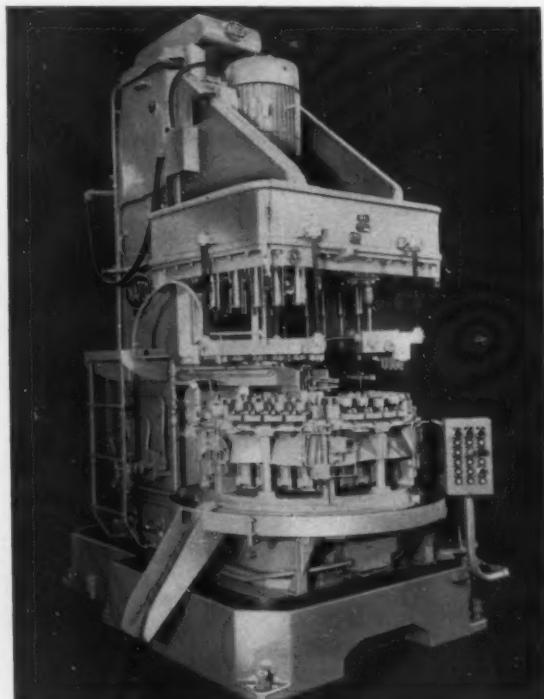


Fig. 1. Vertical Holesteel drilling machine brought out by the National Automatic Tool Co., Inc.

**Fig. 2. Natco drilling machine used in conjunction with drilling machine shown in Fig. 1, for processing valve rocker arms**

through in two steps and one is finish-bottomed. Parts are hydraulically clamped. A hydraulic distributor insures constant clamping pressure at working stations even when parts are loaded or unloaded.

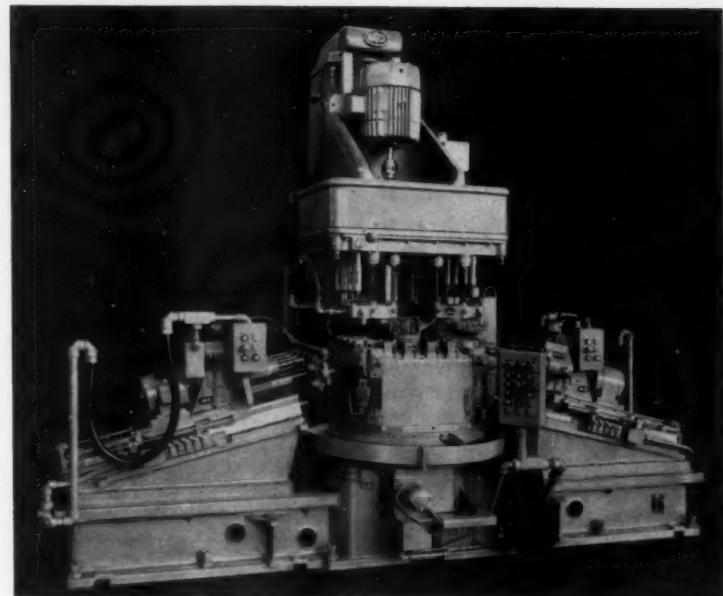
**Circle Item 107 on postcard, page 255**

### Baldwin-Lima-Hamilton Foil Type Strain Gages

Easily applied foil type SR-4 bonded filament strain gages, announced by the Baldwin-Lima-Hamilton Corporation Electronics & Instrumentation Division, Waltham, Mass., are available in two new types that provide fatigue life, sensitivity, and hysteresis characteristics that are claimed to be superior to those of the nearest equivalent bonded-wire SR-4 strain gages. These gages extend the "room temperature" range to 300 degrees F. for continuous duty, or 400 degrees F. for short-time measurements.

Because foil gages are thinner and more flexible, they are more easily applied than wire gages, especially in fillets. They are well adapted for stress analysis work since they are free from internal solder joints and have low sensitivity to cross strain. To combine this feature with superior performance, Type FAP-2 and Type FAB-2 foil SR-4 strain gages have been developed. The Type FAP-2 foil gage, a quick-drying, paper-and-cement bonded gage, is directly comparable to the bonded-wire type gage A5-1. The Type FAB-2 foil gage, a Bakelite-bonded gage, combines the most desirable features of the AB-3 and AB-5 wire types. The marked advantages of both foil gage types in hysteresis, in fatigue life, and in strain sensitivity have been demonstrated by tests.

The gages are provided with tinned lead wires anchored into the body of the gage so that accidental tugs on the leads do not tend to pull out the terminal foil tab. Also, this new arrangement



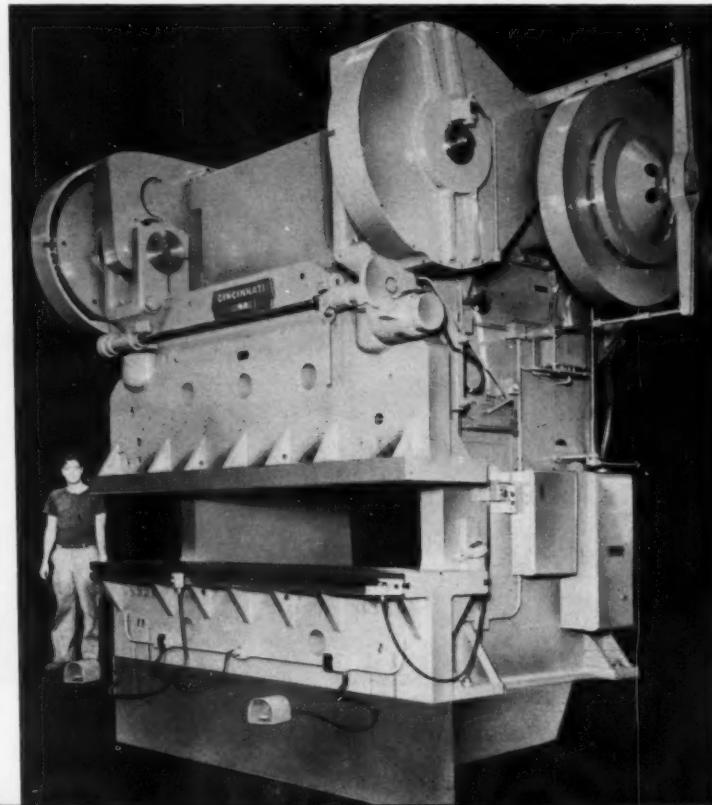
eliminates the delicate operation of soldering leads to terminal tabs. Sensitivity to moisture has been reduced, and electrical and dimensional stability improved by using a glass-fiber filler.

**Circle Item 108 on postcard, page 255**

Press brake designed for mounting heavy corrugating and punching dies built by Cincinnati Shaper Co.

### Cincinnati Press Brake

A 40 Series press brake measuring 8 feet 6 inches between housings, with an over-all die surface of 12 feet, has been built by the Cincinnati Shaper Co., Cin-



cinnati, Ohio. Both bed and ram are made 28 inches wide for mounting heavy corrugating and punching dies.

This machine has a stroke of 8 inches and a shut-height of 22 inches. It is equipped with a power take-off from the main

shaft for driving automatic feeding and withdrawal units. Other features include air-electric clutch control and all-steel, interlocked construction. Two-speed, enclosed transmission permits operation at 5 or 20 strokes per minute.

Circle Item 109 on postcard, page 255

### Cross Transfer-matic Machine Designed to Process Right- and Left-Hand Parts

Automotive front-wheel spindles and steering arms are forged together in one piece and machined on a Transfer-matic recently announced by the Cross Company, Detroit, Mich. This machine processes right- and left-hand spindles together, so that a set for one car is completed with every machine cycle. The rated production capacity of the machine is 144 right-hand and 144 left-hand parts per hour.

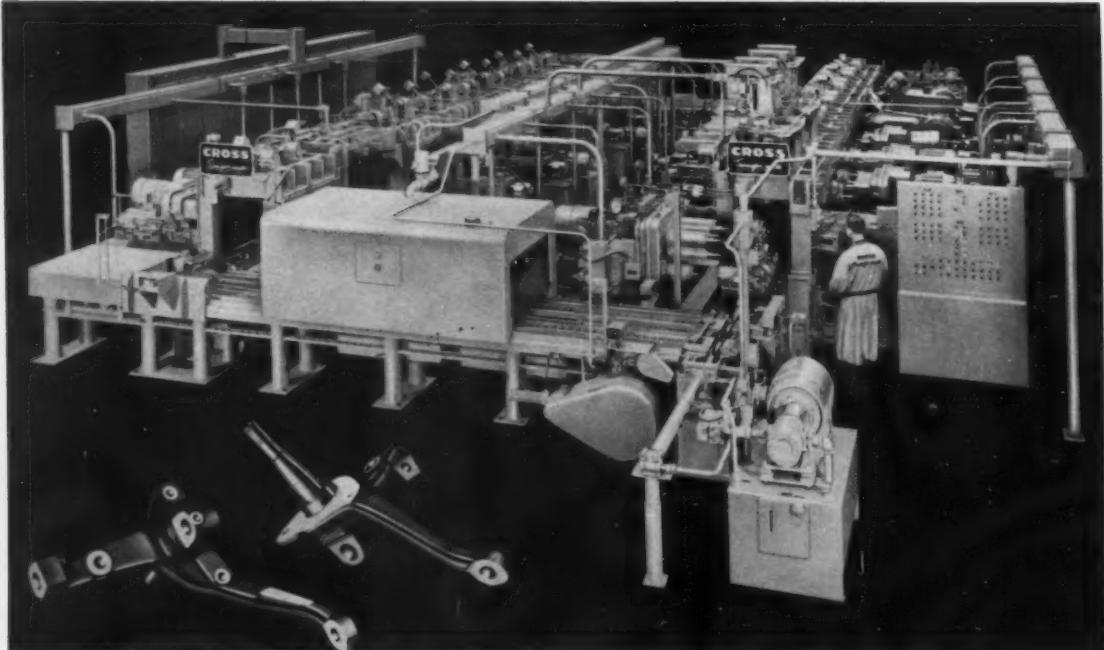
Operations performed by the Transfer-matic are: straddle-mill the upper and lower support arm bosses; straddle-mill the steering-arm boss; mill the steering-arm stop pad; mill the spindle keyway; drill and taper ream the upper and lower support arm holes and the steering arm hole; drill, ream,

chamfer and spot-face the two brake mounting plate holes; drill, counterbore, spot-face, chamfer, and ream the brake anchor hole; drill the spindle cotter-pin hole; and thread the wheel-spindle.

The parts are carried by pallet type work-holding fixtures, which are transferred through the machine's seventeen stations. A push-button-operated power wrench clamps and unclamps the parts in the pallet fixtures. Other features of the Transfer-matic include: construction to JIC standards; hardened and ground ways; hydraulic feed and rapid traverse for milling, drilling, and reaming; individual lead-screw feed for threading; and automatic fixture cleaning unit.

Circle Item 110 on postcard, page 255

Cross Transfer-matic equipped for rapid processing of automotive parts



### G-E Motor-Generator Power Units for Fillerare Welding

Two new Fillerare welding power sources designed specifically for consumable electrodes gas-shielded welding have been announced by the Welding Department of the General Electric Co., Schenectady, N. Y. Both units—the constant arc length and the constant voltage motor generators—are rated at 450 amperes, 60 cycles.

Two-high stacking of the units makes possible considerable savings in floor space. Other features of both units are: redesigned fan and baffled air ducts for reduced noise levels; complete phase insulation of motor stators for increased life; over-sized sealed bearings; and constant pressure brushes designed to insure correct settings.

The constant arc length welder with a rising volt-ampere characteristic is said to eliminate burn-back and stubbing. With controls only for setting arc length, the self-regulating unit will automatically supply the proper current for any wire feed speed required. A special reactor controls

current peaks when welding with carbon dioxide on mild steel, greatly reducing spatter and resulting in cleaner welds, even in cases where out-of-position welding is being performed.

The second power source, the constant voltage motor-generator, decreases the chances of stubbing and burn-back and is more suitable for consumable electrode gas-shielded welding than standard motor-generators with a drooping volt-ampere curve. This unit holds arc voltage constant throughout the welding range, independent of line-voltage fluctuations. Welder adjustment may be required when wire speed is changed, however. The special reactor for control of current peaks when welding with carbon dioxide and mild steel is available as optional equipment on the constant voltage unit.

The Fillerarc welding process will weld aluminum in any thickness from 1/16 inch up and stainless steel from 1/16 inch up, in downhand, vertical, or overhead positions. The process is now in use on aluminum and aluminum alloys; mild, low-alloy and stain-

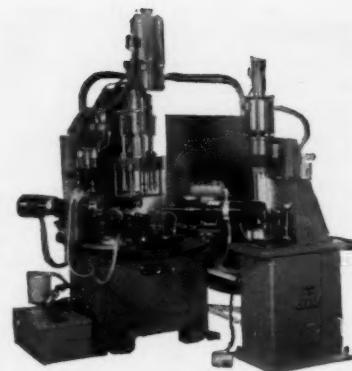
less steel; titanium; copper and copper alloys; nickel; and magnesium.

**Circle Item 112 on postcard, page 255**

### Portage Heavy-Duty Milling Cutter

A Manchester face-milling cutter designed to handle "tough jobs" has been brought out by Portage Double Quick, Inc., Akron, Ohio. This cutter is made of SAE 4140 heat-treated steel and can take a 2 1/2-inch diameter cut. The shearing action of the double inserts provides for fast cutting, yet assures a well finished surface. The carbide inserts can be changed in a matter of seconds and can easily be reset with a tool setting gage, as shown in the lower right corner of the illustration. A tool setting gage is furnished with each cutter, which eliminates indicating and assures equal tooth loading. Settings can be made right at the machine. The carbide inserts offer unusually long service without resharpening. This tool is available with 3/4- or 1-inch diameter shanks.

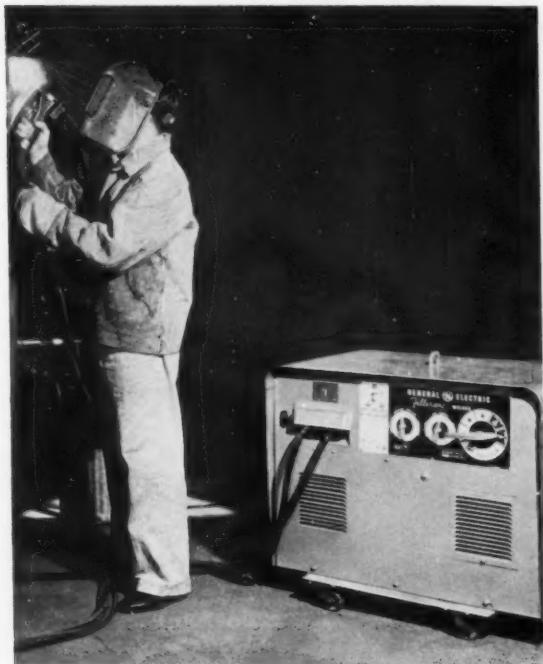
**Circle Item 113 on postcard, page 255**



Two-position drilling and tapping machine brought out by the Govro-Nelson Co.

### Govro-Nelson Dual Drilling and Tapping Machine

Govro-Nelson Co., Detroit, Mich., has developed a machine designed to speed up operations with its automatic drilling and tapping units. This two-position machine incorporates two vertical and five horizontal units for drilling and tapping twelve holes in three similar parts. Two holes are drilled in one position and ten



General Electric motor-generator power source for Fillerarc welding



Portage heavy-duty face-milling cutter with double inserts

holes are tapped in the second position.

The operator alternately loads the two machines, completes the drilling operations on a manually clamped fixture (right), and taps ten holes simultaneously on the second machine (left) which auto-

matically clamps, taps, and releases the part. The output is 300 parts per hour. By changing the number and arrangements of the units, the machine is readily adapted to a variety of drilling and tapping operations.

Circle Item 114 on postcard, page 255

### Fellows Injection Molding Machine

A No. 12-350 injection molding machine for a variety of plastic products in the intermediate-size range of 12 to 20 ounces has been announced by the Fellows Gear Shaper Co., Springfield, Vt. An optional "Pre-Pac" or stuffing device is required for the 20-ounce shots. The machine operates dry at the rate of 700 cycles per hour and handles mold bases up to 20 by 31 1/2 inches with a 14-inch draw. It will also produce deep-drawn, thin-wall parts such as two 1/2-gallon containers with walls 0.035-inch thick on a cycle of less than 10 seconds. Heavier sections can be produced when the machine is operated on a cycle of about 60 seconds.

The heating cylinder is of the Taper-Tite Torpedo design and plasticizes up to 150 pounds of polystyrene at 420 degrees F., plus or minus 10 degrees. A new feature in the cylinder design is a ball joint adapter, into which the

nozzle is screwed, for ready alignment of the sprue bushing and heating cylinder. Cylinder heat control is through three proportioning Amplitrol vibration-proof temperature controllers. Standard nozzle temperature control is by heater band and rheostat, but an optional control kit using a fourth Amplitrol can be purchased. The injection plunger is water-cooled and has rapid traverse in both directions which permits it to be moved either in or out. The hydraulically operated toggle type press has a mold locking pressure of 350 tons.

Although, as a safety precaution, the standard machine control circuit requires the operator to open and close the door before the next cycle will start, the machine can be made fully automatic by the addition of the optional automatic molding kit consisting of recycle timer, air blast, counter, dual injection pressure control,

and low-pressure mold closing safety device.

Controls for time, temperature, pressure and speed, as well as those for all setup functions, are grouped to facilitate both setup and operation. All electric equipment including an "across-the-line" starter and disconnect are included on the electrical panel as part of the machine.

Circle Item 115 on postcard, page 255

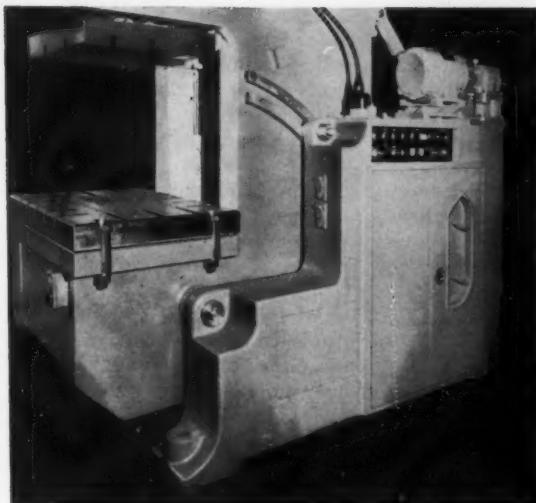
### Minster Press Cabinet Leg

The Minster Machine Co., Minster, Ohio, is supplying cabinets cast within press legs for mounting electrical, air and lubrication controls as extra equipment with its Series 1 open-back and inclinable and Series G1 gap presses. For example, in any inclinable type press of 22 tons capacity or larger, the cabinet interior of either right or left leg can be designed to contain the motor starter, clutch controls, and auxiliary power outlet.

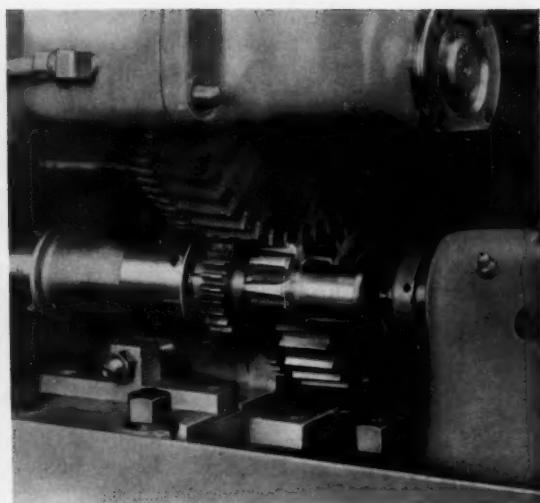
Operator selectors and motor buttons can be mounted in a recessed panel in the upper front of leg. The opposite leg could contain clutch air-supply-filter regulator and safety valve, electric counter, and lubrication system controls. Heavy conduit carries power and control lines between



Injection molding machine announced by the Fellows Gear Shaper Co.



Patented press cabinet leg brought out by the Minster Machine Co.



Steering gear segment being shaved and deburred on Red Ring machine

the legs. Cabinets are of the NEMA Type 12 with moisture-proof enclosures. Compactness and built-in design protects the controls and allows quick adjustment from a central point. These cabinet legs are patented.

**Circle Item 116 on postcard, page 255**

#### **U. S. Burke Half-Mill**

Unlimited accessory combinations for specific applications are said to make the new No. 1 U. S. Half-Mill a valuable production or toolroom milling machine. Developed by the U. S. Burke Machine Tool Division, Cincinnati, Ohio, this compact machine offers unlimited flexibility, together with unusual power and ruggedness.

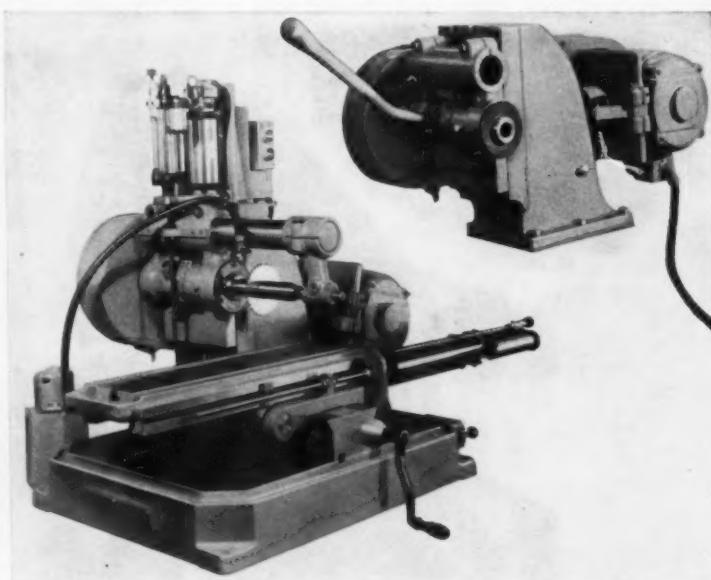
The basic half-mill, powered by a 1- or 2-hp motor, with rack-and-pinion head feed, has numerous production adaptations. For toolroom and light horizontal boring operations, it may be equipped with a micrometer depth stop, screw type manual head feed, and longitudinal screw feed table. Combination of the 18-inch stroke air-hydraulic table feed and 4-inch stroke head feed makes the half-mill into a semi-automatic production machine. For use with carbide or ceramic tooling, it can be equipped with a high-speed head and motor to operate at selective spindle speeds up to 5000 rpm.

A coolant system may be added to the half-mill, since the reservoir and collecting area are cast into the standard base. Also available are: Overarm supports with plain, live, or self-aligning arbor center for added rigidity; rack and pinion feed table; riser blocks to increase distance from cutter to base or table top; and a welded steel pedestal for applications where the bench type of mounting is undesirable.

**Circle Item 117 on postcard, page 255**

#### **Red Ring Shaving and Deburring Process**

A process that permits combining gear-tooth shaving and outside-diameter deburring operations in sector gears on standard Red Ring rotary shaving machines has been announced by the National Broach & Machine Co., Detroit, Mich. The method has been initially applied to the finishing of teeth on steering-gear segments having the conical involute (tapered tooth) form.



Half-Mill developed by U. S. Burke Machine Tool Division

To carry out the simultaneous sector-gear shaving and deburring operation on a conventional shaving machine, a new type of rotary deburring tool in the form of a gear has been developed. This high-speed steel tool has a conical involute tooth shape and meshes with the gear segment. The form of the deburring tool teeth at their root portions is designed in such a manner that the shaving burr at the outside diameter of the sector

work gear is removed as it is produced.

The deburring tool is mounted on an auxiliary spindle on the table at the rear of the shaving machine head and tailstock. Proper timing relationships between the conical involute (tapered tooth) shaving cutter, work driving head, and deburring tool are achieved by a train of precision gears of the correct speed ratio.

Circle Item 118 on postcard, page 255

### Giddings & Lewis Spar- and Skin-Milling Machine

The first regular production model of a numerically controlled spar- and skin-milling machine built by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., has been given final cutting tests and approval by the defense department and aircraft technical staffs. This machine will be used by the Martin Co., Denver, Colo., in the production of airframe components for the "Titan" intercontinental ballistic missile.

The machine illustrated is

equipped with the Giddings & Lewis Numericord system magnetic tape control. In this system decimal, numerical data for all machining functions is directly programmed off part drawings and converted electronically into time-motion-coordinated, electrical-machine-command signals.

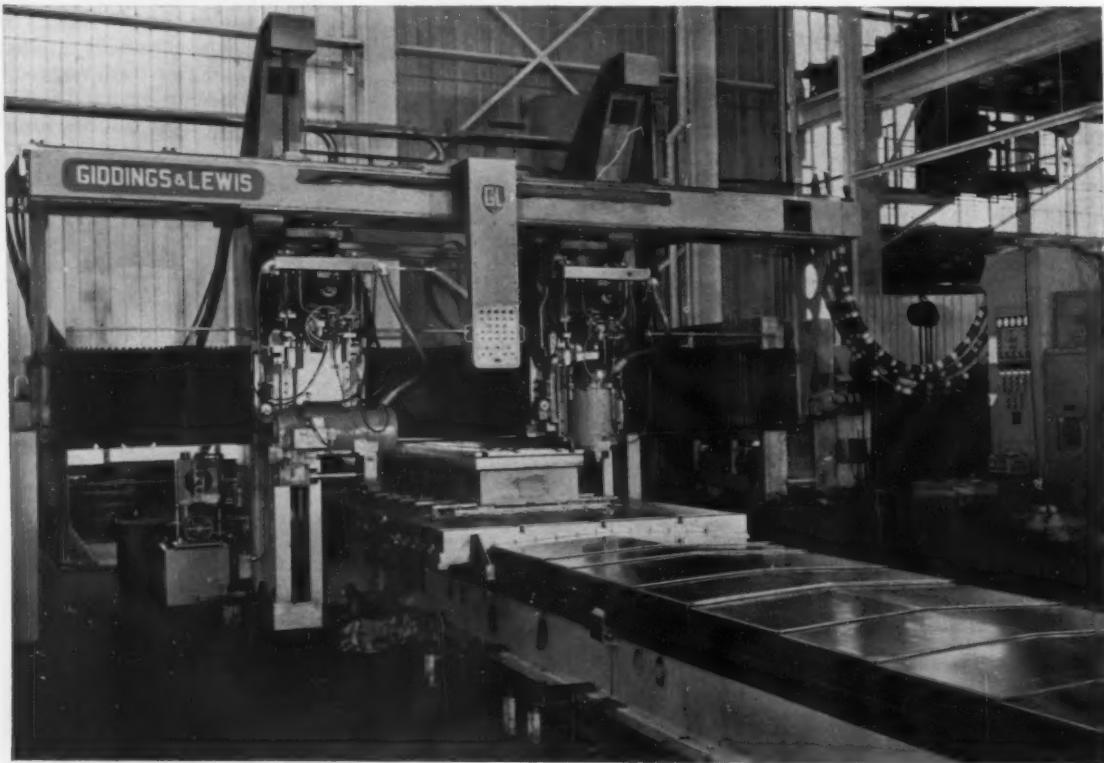
Transcribing data from programmers' manuscript to perforated paper tape is readily accomplished by clerical help. This operation is simplified by

a normal 10-digit keyboard and is safeguarded by logical circuitry which automatically checks the accuracy of all data fed into the perforating unit.

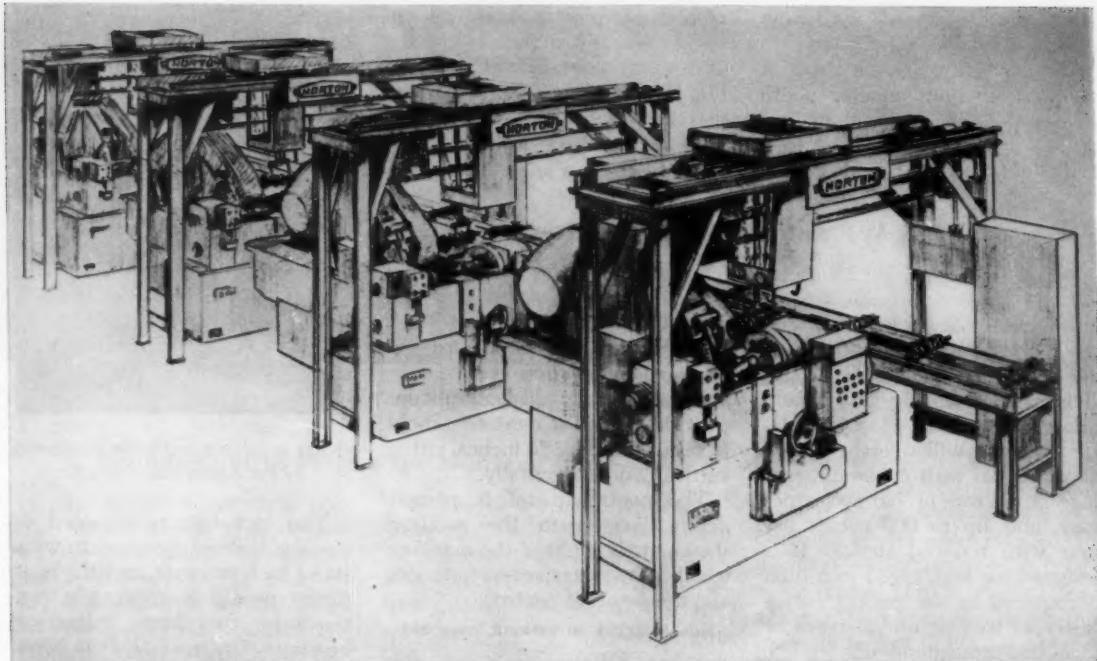
The completed paper tape represents a permanent storage medium of all skills, decisions, and computations necessary to machine a part completely and automatically. Its primary function is to present all command data, in serial form, to the system's electronic computing director. Here, the paper tape is "read" line for line, some data going into "memory" units for later call up, some being immediately processed in coordinating circuits for recording on the 14-channel, machine-control magnetic tape, as required to complete the milling operations.

The exceptionally rigid, closed rectangular arch and rail design permits interchanging ferrous and non-ferrous cutting heads. This type of equipment is also well adapted for use in other production fields and in job shops handling certain classes of work.

Circle Item 119 on postcard, page 255



Spar- and skin-milling machine with numerical control built by Giddings & Lewis Machine Tool Co.



Unitized transfer type automatic crankpin grinding machine announced by the Norton Co.

### Norton Automatic Crankpin Grinding Machine

The Norton Co., Worcester, Mass., has announced the development of a No. 2 unitized transfer type crankpin grinding machine for completely automatic, high-production precision grinding of automotive type crankpins. Four-pin crankshafts can be finish-ground with no manual effort at the rate of 240 pins per hour.

The machine consists of separate, self-contained, easily regulated units. Each unit grinds a single pin on the crankshaft independently of the other units. Because of this feature, any unit may be cut out of service without affecting operation of other units. The units are installed in a row, one behind the other, as shown in the illustration, and are connected only by means of a conveyor which carries the cranks.

Fast work loading and unloading is made possible by a double hook loading mechanism. An unground crank is placed in the work-holders as soon as the ground crank is removed. All transferring of the work is done during the grinding cycle.

The loading mechanism automatically locates the work in the

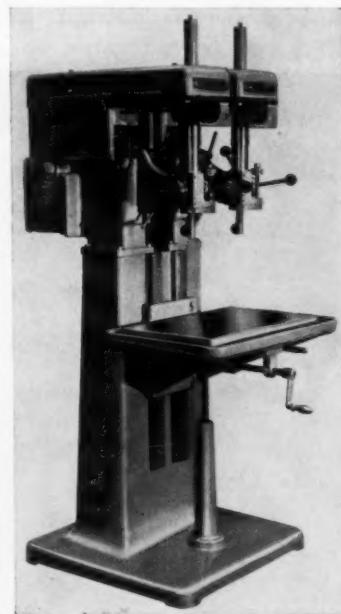
correct position for grinding. Other features include: automatic wheel truing coupled with automatic wheel-wear compensation; constant peripheral wheel speed; balanced torque work-spindle drive; and a complete system of safety interlocks that shut down the machine in case of malfunctioning.

**Circle Item 120 on postcard, page 255**

### High-Speed Sensitive Drilling Machine

A Model 1F high-speed sensitive drilling machine with a 10-inch overhang has been announced by the Edlund Machinery Co., Cortland, N. Y. This machine is designed for high-speed, sensitive drilling of small parts and assemblies and is particularly adapted for handling high-production, long-run work on large parts. It is available in standard or special-purpose combinations and can be adapted to meet a wide range of work. Machines are available with from one to six spindles and with speed ranges from 625 to 10,000 rpm.

Positive control of spindle speed to suit a particular job requirement is obtained by simply turning a knob, located on the upper column, without stopping to change belts or gears. The



High-speed drilling machine built by Edlund Machinery Co.

exact spindle speed is always shown in the speed indicator window next to the control knob. A pre-positioned micrometer depth gage provides positive control over tool penetration. The large, double-knurled knob with clearly

etched micrometer markings can be set for any depth within the 3-inch traverse range of the spindle. A three-handled feed-wheel permits selection of the most convenient feed-lever position.

Circle Item 121 on postcard, page 255

### H-P-M Plastics-Molding Machine

A new 6- to 8-ounce plastics injection molding machine for which exceptionally fast operation is claimed has been announced by the Hydraulic Press Mfg. Co., a division of Koehring Co., Mount Gilead, Ohio. This Model 200-H-6/8 machine will operate at full clamp stroke with maximum tonnage at the rate of 720 cycles per hour, and up to 900 cycles per hour with reduced stroke. It is designed for high-speed jobs such as required in the packaging industry as well as for all types of difficult custom molding.

This 200-ton unit (with a 30-hp motor) features a full hydraulic clamp with 15-inch stroke and 25-inch daylight height. The clamp automatically adjusts itself for different mold thicknesses, thus reducing mold setup time to a minimum. The injection circuit has controls designed for "prepacking" "shots" of 8 ounces or over; flow control for plunger slow-down; dual pressure adjustment for

lower holding pressure after mold is filled; and automatic unloading of injection pump, which results in savings in power and water and insures longer pump life.

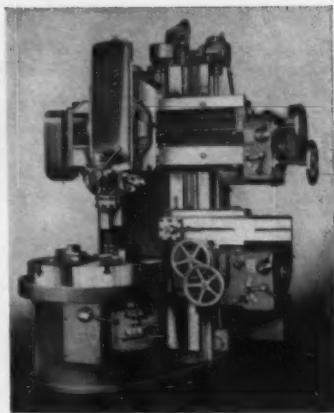
Large 26- by 26-inch platens provide space for mounting mold bases up to 15 by 26 inches, either vertically or horizontally.

The control panel is permanently located in the position shown at the right of the machine which allows easy access to timers and temperature controls.

Circle Item 122 on postcard, page 255

### Niles-Imperial Vertical Turret Lathe

The Aaron Machinery Co., Inc., New York City, distributors for the German-made Niles-Imperial vertical turret lathe, is introducing this machine in a 41/51-inch size—swing with side head in position is 41 inches and with side head below the table, 51 inches.



Niles-Imperial vertical turret lathe distributed by the Aaron Machinery Co.

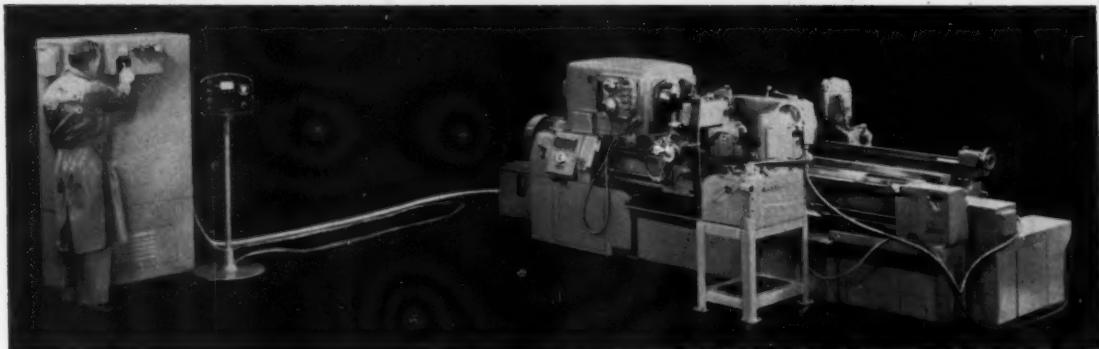
The faceplate is mounted on circular V-ways designed to withstand high pressure, and the faceplate spindle is accurately centered by two large cylindrical bearings. The main shaft is bored to take long-stemmed boring tools.

Twelve faceplate speeds are available, all controlled by two levers. The drive gear case can be removed as a unit from the column when the screws are removed. The belt pulley is located on the drive gear case, protected by a guard and driven directly by the motor.

Circle Item 123 on postcard, page 255



Plastics injection molding machine announced by the Hydraulic Press Mfg. Co.



Remote-control system developed for Monarch Series 62 lathes

### Remote-Control System for Monarch Lathes

A remote-control system to operate Monarch Series 62 lathes with air-gage tracer equipment from a distance of 12 feet or more is announced by the Monarch Machine Tool Co., Sidney, Ohio. This control is designed for special turning applications such as machining radioactive materials, contouring solid propellants for rockets and missiles, or wherever it is desirable to position the operator at a distance from the machine. The remote-control system consists basically of an electrical control cabinet and operating panel plus a separate auto cycle control stand, both electrically connected to the machine.

The main drive motor of the

lathe can be started, stopped, or reversed; the spindle can be jogged, run, braked, or shifted to a second pre-selected turning speed; and feed rates may be varied—all from the remote position. Actual tool movements are regulated during operation by the air-gage tracer mechanism mounted directly on the machine, with the complete cutting cycle, including traverse return, under

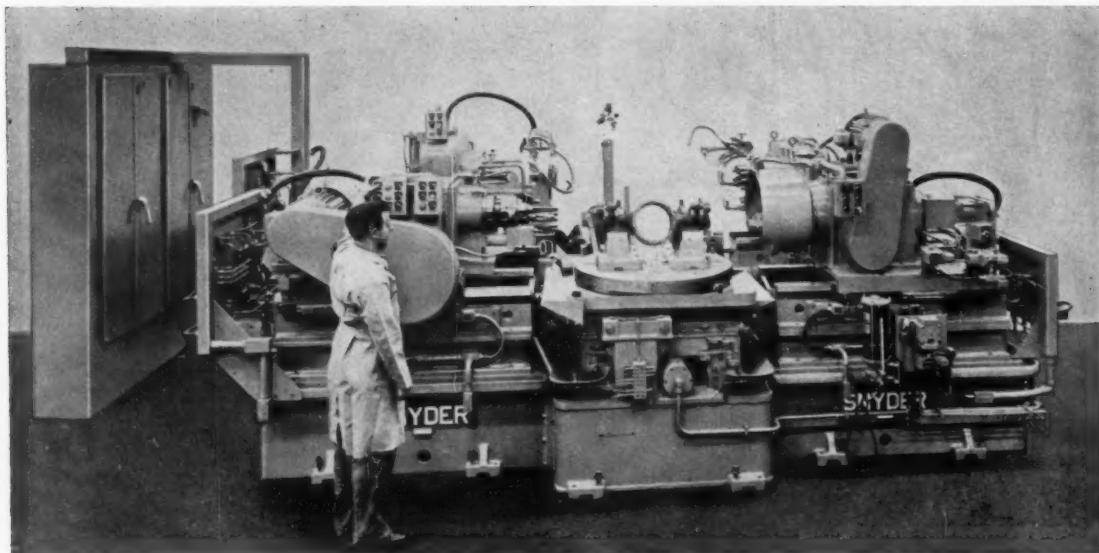
fully automatic control. When using this new control arrangement it is not necessary for the operator to be able to see the machine while turning is in progress. Where certain critical machining jobs require the lathe operator to follow the progress of the cut from the remote-control position, a closed circuit television hookup can provide the necessary close-up view.

Circle Item 124 on postcard, page 255

### Snyder Line-Index Machine for Processing Tractor Axle Housings

Partial automation has been applied to a line-index type machine designed and built by the Snyder Tool & Engineering Co., Detroit,

Mich., for the economical production of limited quantities of a variety of parts. This special machine performs up to forty drill-



Snyder hydraulically operated and electrically controlled line-index machine

ing, boring, turning, and tapping operations to complete the machining of three different large tractor drive axle housings. The housings are made of either malleable iron or cast steel. One housing is produced at a net rate of 9.1 pieces per day, the second at 10.2 parts per day, and the third at 8.5 parts per day.

Flexibility of machine operation is provided by mounting the part in a fixture with a built-in index-table. This fixture and table unit is indexed in a line to six stations between a pair of opposed wing-base machining units. Where

required, the fixture is rotated 180 degrees between stations.

The machine is hydraulically operated and electrically controlled. Standard way type machining units have automatic lubricating systems. Separate hydraulic power packs provide power for operating the machine slide and index motions. All units have hardened and ground ways. The tapping head has individual, automatically lubricated, lead-screw drives for each spindle. The heads are driven by 7 1/2-, 10-, 15- and 20-hp motors.

Circle Item 125 on postcard, page 255

### Automated Machine for Processing Pump Impellers

An automated eight-station rotary index machine that accurately positions and performs machining operations on production parts is available from the Expert Automation Machine Co., Detroit, Mich. This machine spot-surface, reams, bores, and bearingizes the sintered iron bore and thrust face of 6-inch diameter plastic automotive water-pump impellers at a production rate of 700 pieces per hour at 80 per cent efficiency. By changing the fixtures and heads, this machine can handle large or small parts.

The machine has sixteen over-center toggle type clamping fixtures (two per station) which automatically center and square the part and clamp it in position prior to the machining operations. A unique expandable rubber

automatic unloading mechanism removes the part from the fixtures after all machining operations have been completed. All machining heads are mounted on Expert standard way units. These electrically controlled and hydraulically operated units have an advance and return rate of 300 inches per minute and a thrust of 7000 pounds. Six adjustable dogs control the operation of the way unit.

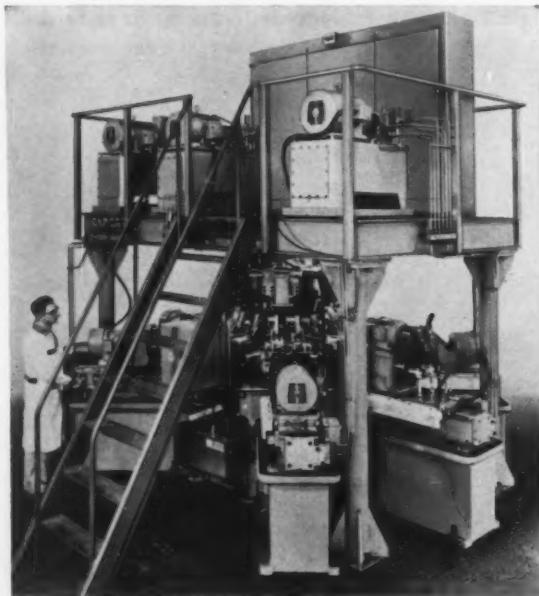
The index table is driven by a cam index mechanism with a mechanical shot pin. The high torque rating of this index mechanism permits the indexing of the 2500-pound table (including fixtures) from station to station in 1 3/4 seconds without shock or impact. The cam index mechanism is driven by a gear reducer and a 2-hp electric motor. The machine occupies a floor space about 12 feet in diameter and is approximately 14 feet high.

Circle Item 126 on postcard, page 255

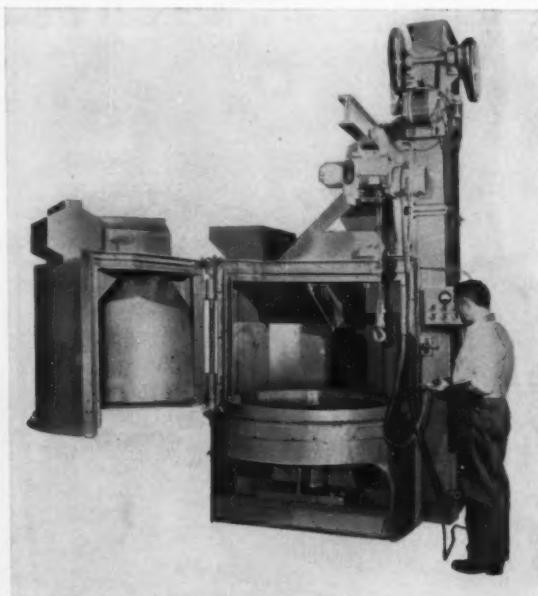
### Pangborn Small-Size Rotoblast Cleaning Table

The Pangborn Corporation, Hagerstown, Md., has introduced a 48-inch Rotoblast table for foundries and plants that require a small, flexible machine for a

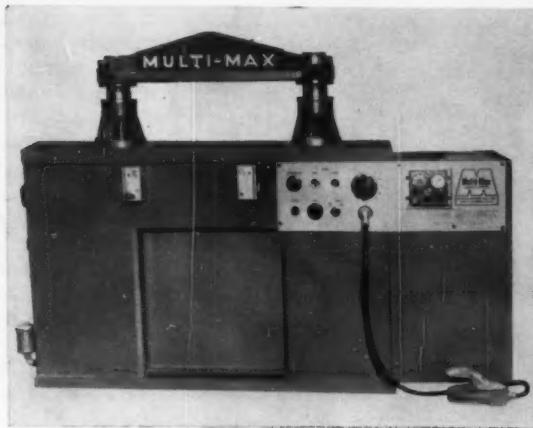
wide range of cleaning operations. Castings, forgings, and stampings up to 48 inches in diameter by 24 inches high, as well as plastic and composition materials, can be



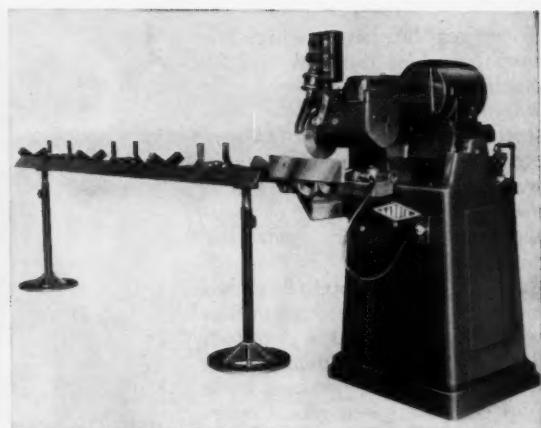
Eight-station rotary index machine built by Expert Automation Machine Co.



Small Rotoblast cleaning table introduced by Pangborn Corporation



Diamond high-speed "Multi-Max" punch press



Landis air-operated roller pipe cutter

economically blasted in this low-cost unit.

The equipment will handle loads weighing up to 4000 pounds. A cast labyrinth abrasive sealing system makes the cabinet abrasive-tight without rubber gaskets. For efficient loading, a single door opens to expose half of the 48-inch diameter rotating work-table.

A single overhead Rotoblast wheel, powered by a 10-hp motor, will throw 15,000 pounds of abrasive per hour and for extra cleaning capacity, an optional 15-hp motor is available that will throw 22,000 pounds of abrasive per hour. For maximum abrasive efficiency, a self-contained automatic elevator and separator continuously clean used abrasive for recirculation to the Rotoblast wheel.

**Circle Item 127 on postcard, page 255**

### High-Speed Multi-Max Punch Press

The Diamond Machine Tool Corporation, Pico, Calif., has announced a completely redesigned Multi-Max punch press. It is available in capacities of from 40 to 125 tons and in two- and four-post models, with speeds of from 40 to 1000 strokes per minute. Bolster and ram areas range from 2 by 2 feet up to 4 by 12 feet with unlimited shut die height.

Material can be fed from front to back, back to front, and side to side. Safety features include: two-hand control, with locking device on left-hand control providing

safe one-hand operation; hand-switch that is automatically off when foot-switch is operable; key lock control on control panel; and automatic stop on downward stroke of ram if operator takes hands off controls. In the event of power failure the machine automatically "fails safe."

**Circle Item 128 on postcard, page 255**

### Timken Roller Bearings of Increased Capacity

The capacity ratings of most series of roller bearings manufactured by the Timken Roller Bearing Co., Canton, Ohio, have been increased, according to the company's engineers. The majority of the ratings have been raised by approximately 10 per cent, while some capacities have been increased as much as 39 per cent. The higher ratings make it possible to use smaller bearings in many applications, which results in a more compact product and a reduction in the amount of material required, since the size of shafts and housings can be commensurately reduced. The smaller size makes possible new uses.

Three things led to these increases in Timken bearing capacities: a review of more than 6000 different laboratory studies of bearing performance on fatigue life testing machines; review of the life of millions of Timken bearings in the field; and, finally, refinements in the method of analyzing these studies mathematically.

**Circle Item 129 on postcard, page 255**

### Landis Roller Pipe Cutters

The Landis Machine Co., Waynesboro, Pa., has recently developed a 2B series of pipe- and nipple-cutting machines designed to replace the No. 2 style cutters. The new machines feature an increased capacity of 1/8 to 3 inches and offer higher production rates. They also incorporate many new design principles. Three methods of cycling are available—air, manual and gage, or automatic. The desired method can be quickly and easily selected by setting a switch on the electrical control panel.

In the manual cycle the cutting-off assembly descends, performs the cutting-off operation, and returns to the load position. To repeat the operation, the operator must depress the "down" button after each cycle. When operated in the "gage" cycle the 2BA machine functions semi-automatically. Placing the pipe against the length gage activates a micro switch to begin the cycle. The cutting-off unit descends, cuts off the length of pipe or nipple, and returns to the load position. This cycle is repeated each time the pipe contacts the length gage. When operated automatically, the machine repeats the cutting-off cycle continuously.

The stroke rate of the cutting unit—when using the machine for manual, semi-automatic, or automatic operation—can be regulated to produce up to a maximum of fifty cycles per minute. A worm-

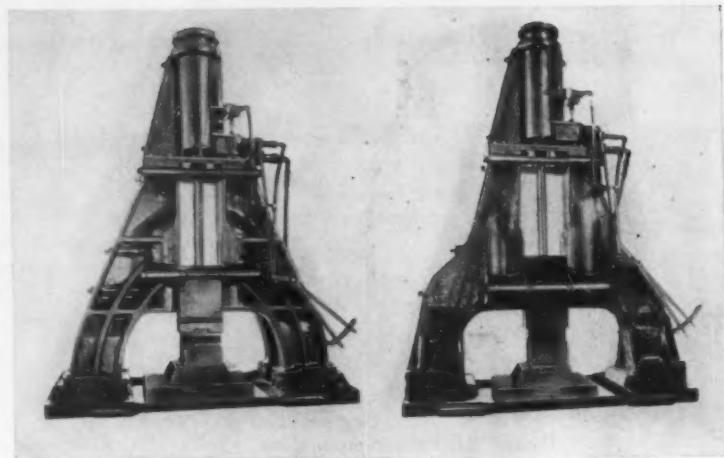
driven gear-box having a high-low range provides the 2BA and 2B machines with spindle speeds of 200 and 240 rpm. A single alloy-steel cutter disc 8 inches in diameter, heat-treated for maximum wearing qualities, is used in both machines. This disc can be resharpened until a minimum disc diameter of 5 inches is reached. Any length of pipe up to 24 inches can be cut off by positioning the pipe length gage on the gage rod. Both the air and manually operated machines are powered by a 5-hp constant speed motor operating at 1800 rpm.

**Circle Item 130 on postcard, page 255**

### Huge Steam Forging Hammers

Two double-frame steam forging hammers have been built by Chambersburg Engineering Co., Chambersburg, Pa., for shipment to Santiago, Chile. These 16,000- and 10,000-pound machines will be the largest forging hammers in South America and will work as a team, producing steel railroad tire rings and axles.

The 16,000-pound hammer will be used to pancake and pierce billets weighing up to 1100 pounds. Moved to the 10,000-pound hammer and placed in a special die set, the forging is expanded to the proper tire thickness. After re-heating, the forging is placed in a finishing mill where the steel



Double-frame steam forging hammers built by Chambersburg Engineering Co.

tire is expanded to its final diameter and the rim is shaped.

Using dies with half-round impressions machined in each die

face, the 10,000-pound hammer will also be used for forging railroad axles.

**Circle Item 131 on postcard, page 255**

### Natco "Holeway" Transfer Machine for Processing Cylinder Blocks

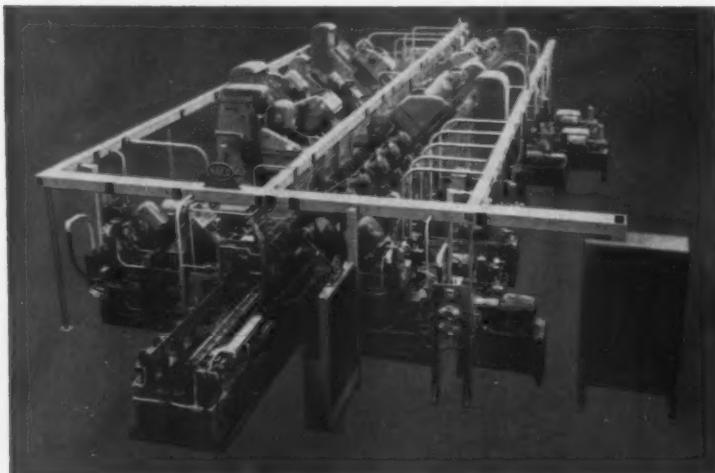
One hundred twenty cylinder blocks per hour are processed through twenty-one stations of a new "Holeway" transfer machine built by the National Automatic Tool Co., Richmond, Ind. Parts handled on this machine can easily be removed by dropping the guide rail at stations which operate on one side only. All drilling and milling operations are completed on faces presented

with the pan face up. Fifty-six operations are performed on a part as it progresses through the stations which include one loading, thirteen machining, three idle, one rotating, one inspection (plugs check for broken drills and depth), one for chip dumping, and one for unloading. Since the part must be located from the top, it is elevated over fixed pins and up against locating pads.

**Circle Item 132 on postcard, page 255**

### Improved Oxy-Acetylene Welding and Cutting Outfit

An improved model of its Prest-O-Lite No. 420 welding and cutting outfit capable of welding material up to 3/8 inch thick and cutting metal up to 2 inches in thickness has been introduced by the Linde Co., Division of Union Carbide Corporation, New York City. This outfit includes the Prest-O-Lite No. 420 blowpipe which welds, cuts, heats and brazes without a cutting attachment. Recent changes have made this blowpipe easier to use. For example, the cutting oxygen lever has been moved to the top of the handle where it can be turned on or off with the thumb. A green



Natco "Holeway" cylinder block processing machine

plastic ring has been placed around the oxygen valve and a red ring around the acetylene valve for positive identification.

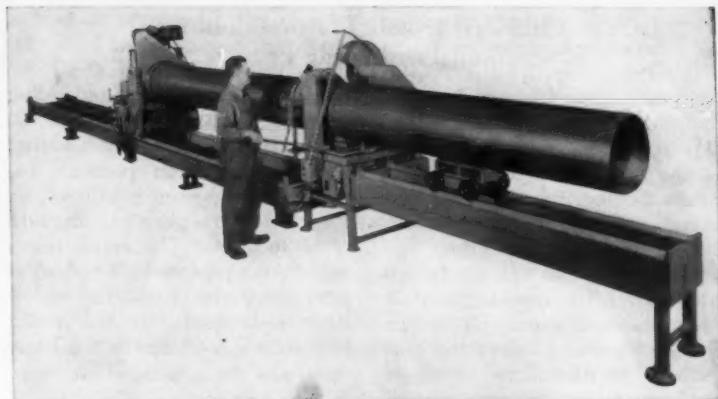
Plastic gage crystals for oxygen and acetylene regulators have been replaced by non-clouding glass kept in place with a screw-type retaining ring. Besides the No. 420 blowpipe and R-412 and R-413 regulators, the new model welding and cutting outfit includes: four interchangeable tips (three welding, one cutting) and a 12 1/2-foot twin hose.

Circle Item 133 on postcard, page 255

### Wallace Large-Capacity Pipe-Cutting Machine

A newly designed machine capable of cutting pipe 20 inches or more in diameter with a surface finish suitable for gasket face use has been announced by Wallace Supplies Mfg. Co., Chicago, Ill. The machine shown can handle a 40-foot double random length of pipe with a wall thickness of 7/8 inch. Heavier pipe can be cut provided the first section to be cut is 5 feet or more in length.

The controls used to move the chucking drive up and down for centering and the locking system which holds the chuck in the proper position longitudinally are hydraulically operated. Movement of the chucking device back and



Large-capacity pipe-cutting machine made by Wallace Supplies Mfg. Co.

forth to control length of cut piece is electrically actuated as are the rotating and cutting units. Larger size machines can be made to order.

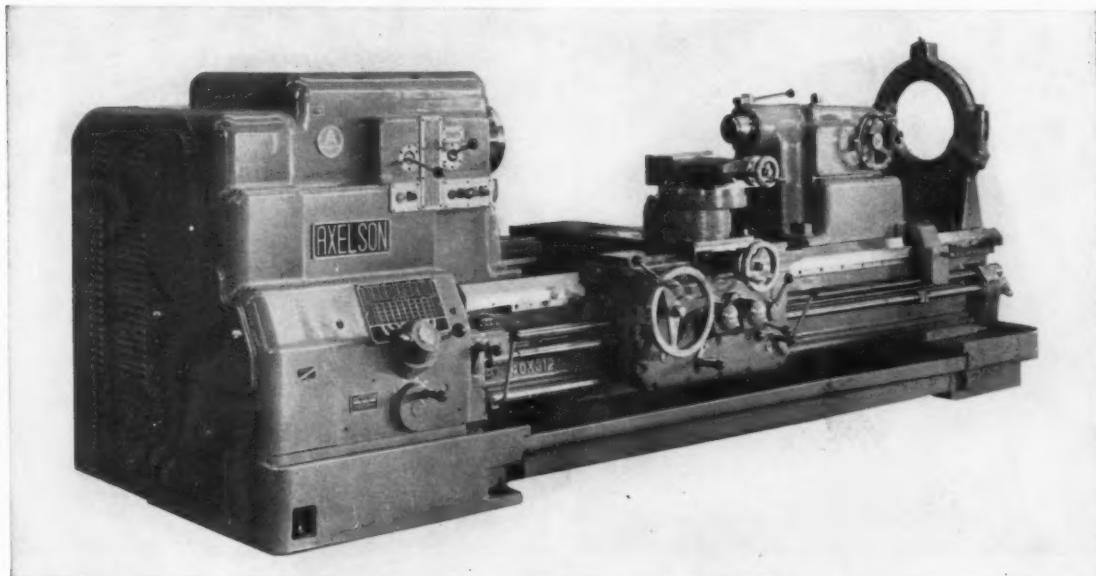
Circle Item 134 on postcard, page 255

### Axelson Heavy-Duty Lathe

The Axelson Mfg. Co., Division of U. S. Industries, Inc., Los Angeles, Calif., has added a new Model 4431 lathe to its line of machine tools. This lathe swings 44 inches over the ways, 31 inches over the cross-slide, and has a 75-hp motor capable of developing over 100 hp for peak-load requirements.

Headstock controls provide a range of spindle speeds, from 7 to 650 rpm in true geometric progression. The rigid, one-piece cast tailstock has a two-speed spindle. This provides a rapid rate for setting the center and a slow movement for drilling, boring, etc. Sixty-one feeds and forty-five thread-cutting leads are furnished by the totally enclosed gear-box. The cast-steel, compound rest is capable of extended travel. The apron is of extra-heavy box type design and is completely enclosed so that all shafts and gears operate with automatic pressure lubrication.

Circle Item 135 on postcard, page 255



Heavy-duty lathe brought out by the Axelson Mfg. Co.

## Elmes Hydrolair Plastics-Molding and Laminating Press

A small, low-cost, pumpless and motorless hydraulic press, called "Hydrolair," has been brought out by the American Steel Foundries, Elmes Engineering Division, Cincinnati, Ohio, for plastics-molding, laminating, compacting, and similar work. This unit can be operated from the regular shop air line. Standard model Hydrolair presses are said to meet the production requirements of most small-press users. To meet special requirements with maximum efficiency and economy, custom-designed units like the special type Hydrolair shown here have been developed.

The platen on standard models is of the moving-up type. The specially built unit illustrated, however, has a moving-down platen designed for an assembly operation wherein manual controls operate the pressing platen and a foot-switch is installed for actuating an unloading mechanism. The housing containing the controls has been extended to permit

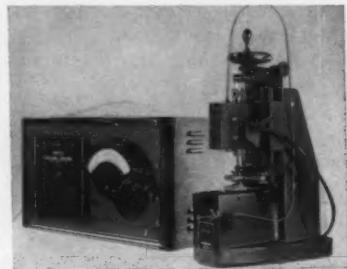
mounting a loading and unloading table at the press-bed level.

This press is manually operated and has a 50-ton pressure capacity. For power it utilizes air from the shop air line at a pressure of 80 to 90 psi. The air-oil reservoir, Elmes patented air-hydraulic intensifier, the hydraulic cylinders, and practically the entire hydraulic circuit are in the base.

**Circle Item 136 on postcard, page 255**

## Federal Electronic Comparator

Dimensional variations as small as one millionth of an inch can be detected with a super-sensitive electronic comparator recently developed by the Federal Products Corporation, Providence, R. I. This comparator, designated Model 130 B-9, was originally built to measure precision ball bearings, but it is completely adjustable and may be used for parts of various shapes and sizes.



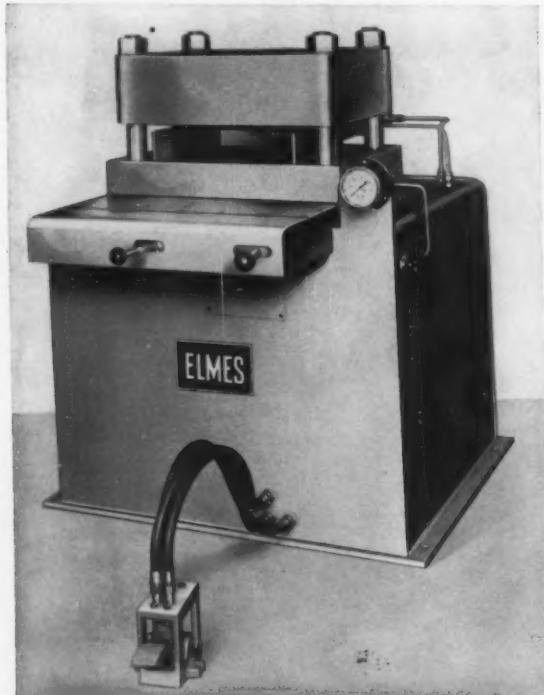
Federal super-sensitive electronic comparator

Any one of four magnifications can be selected quickly by means of a switch. They range from 60,000 to 1 (0.000001-inch graduations) to 2000 to 1 (0.000030-inch graduations). Ample electrical zero adjustment is provided. The gage capacity is adjustable over a wide range.

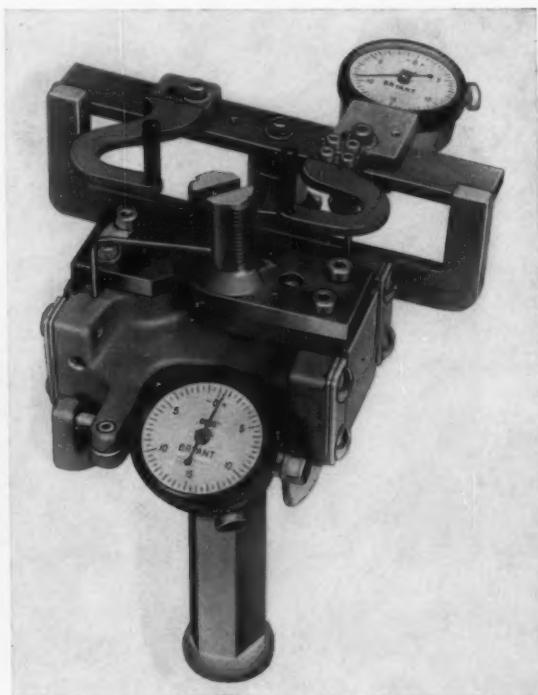
**Circle Item 137 on postcard, page 255**

## Squareness Attachment for Thread Gage

A squareness-of-face checking attachment has been developed for the Bryant P-21 portable inter-



Hydrolair molding press announced by American Steel Foundries, Elmes Engineering Division.



Squareness-of-face attachment for Bryant portable internal thread gage.

nal thread gage by the Bryant Gage and Spindle Division, Springfield, Vt. This attachment permits a face, shoulder, or counterbore to be checked for squareness in relation to a thread during machining as well as at inspection. A complete check of the internal thread is made at the same time. The attachment can be quickly clamped to any standard Bryant P-21 portable gage.

**Circle Item 138 on postcard, page 255**

### Wallace "Roll-A-Round" Dry Abrasive Cut- Machining Unit

A versatile low-cost cutting machine for performing a variety of cutting operations on a wide range of pipes, tubes, and structural shapes has been developed by the Wallace Supplies Mfg. Co., Chicago, Ill. This unit is available in two stock sizes: One for cutting hollow sections 6 5/8 inches in diameter or such shapes as will fit into a circle 6 inches in diameter; and the other for handling hollow sections (such as pipe or tube) with outside diameters up to 12 5/8 inches, as well as structural

or special sections which will fit into a 12-inch circle. Other sizes will be made to order.

Electrical power controlled through a drum type reversing switch makes rotation of the cut-

ting unit simple and positive. A variable drive system permits selection of the proper speed for rotation of the cutting head around the work.

**Circle Item 139 on postcard, page 255**

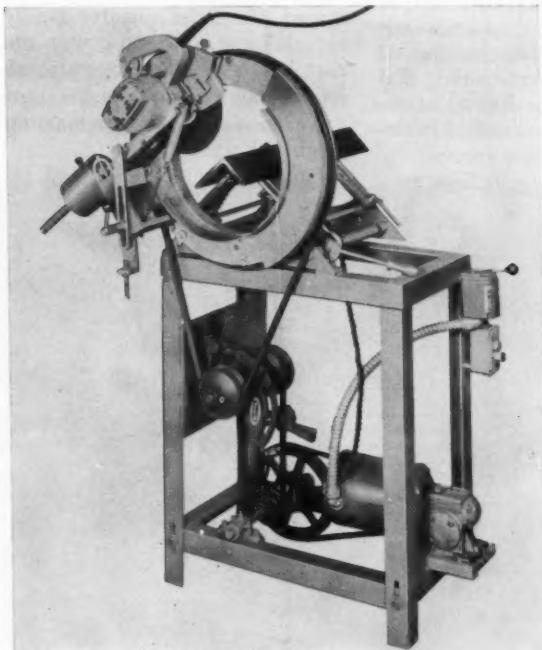
### Aronson Positioner for Welding Titanium

A fully automatic positioner for use in welding titanium has been brought out by Aronson Machine Co., Arcade, N. Y. This Model 21TS "Titanium Special" positioner provides a 64-inch diameter gastight seal plate under the 60-inch round eight-slot precision-machined table. A plastic gastight dome can be placed over the table and work-piece when welding in a gaseous atmosphere. The positioner features precision-controlled rotation at variable speed and fast positioning, powered tilting, and powered elevating, all pre-set in an electrical panel. An electric tachometer with a 7-inch dial that is accurate to 2 per cent, shows the rpm table speed setting of the transmission with the table turning or stopped.

The table-tilt gear-motor and elevation gear-motor are equipped

with magnetic braking and fully adjustable precision limit switches. The elevation chassis is carried on roller bearings to eliminate sliding friction. The table rotation drive has infinitely variable speed from 0 to 2.7 rpm and fast positioning at constant speed of 4 rpm. A 3-hp variable-speed transmission and 2-hp double-end motor complete the rotation drive system. The table tilts 135 degrees in 23.4 seconds with 3-hp syncogear motor and elevates 24 inches full travel in 15 seconds with 3-hp syncogear motor. Load capacity is 5000 pounds with center of gravity 6 inches above table and 4 inches off-center. Rotation torque is 20,000 pounds-inch. The heavy-duty steel base is equipped with 8-inch heavy-duty V-groove casters for portability on a track.

**Circle Item 140 on postcard, page 255**



"Roll-A-Round" dry abrasive cut-machining unit made by Wallace Supplies Mfg. Co.



Automatic positioner for welding titanium made by Aronson Machine Co.

## Circular Storage Unit for Collecting, Storing, and Feeding Parts

A new type storage unit for handling parts that do not roll in automated processing lines has been developed by the Gear-O-Mation Division, Michigan Tool Co., East Detroit, Mich. Designated a circular storage unit, the equipment is designed to offer a true demand-feeding system from a controlled mobile-storage medium for irregularly shaped and interlocking parts.

Although primarily designed for parts such as spur gears, the unit can also be used for rolling parts. It works on a "first-in, first-out" principle with no dead storage. As shown, the unit is storing blanks having a high finish.

Each unit is custom-tailored to a specific job and assembled from standard components. In operation, the parts are gravity-fed from a collecting conveyor and enter the storage unit at a top central position. They are then chuted to the center of the upper tier where they slide onto the inner tracks. The tracks run spirally to the outer edge of the tier. Parts motion is imparted by the independently rotating tier base—the track rails do not move, merely retain the parts laterally. Each tier handles about 300 parts.

The parts leave the upper tier at the outer edge and are gravity-fed to the next lower tier where the outward-from-center spiral

parts movement is repeated. Exit from this tier is to a distribution system for the next operation.

Circle Item 141 on postcard, page 255



Storage unit for non-rolling parts developed by Gear-O-Mation Division, Michigan Tool Co.

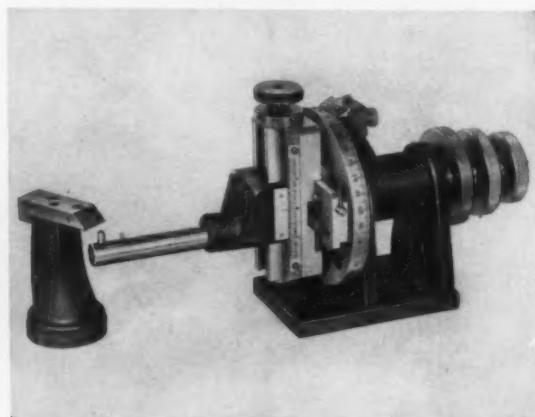
## Automatic Pinch Jaw Chuck

The Cushman Chuck Co., Hartford, Conn., has announced a new work-holding device called Pinch Jaw Chuck. This chuck is designed for use on vertical- or horizontal-spindle machines and has been developed especially for chucking parts of large diameter and small cross-section without strain or distortion while they are being machined to extremely close tolerances.

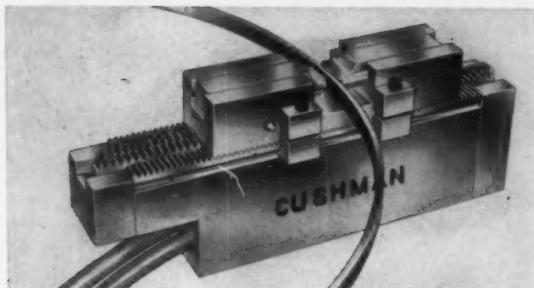
The chuck consists of a body with multiple pinch jaw units and three self-centering master jaws. Each pinch jaw and the centering unit containing the master jaws are operated by self-contained reversible type air motors with necessary valving and regulating controls for full operation located in a small area at the periphery of the chuck.

Operation of the chuck is provided by means of a quick-connect coupling which is disconnected from the air supply after setup. The chuck is divided into three separately controlled units: the self-centering unit, and the two groups of opposing pinch jaws. Each of these units has two air valves which control movement direction. In order to chuck a work-piece, the operator merely actuates one valve to center the part, another valve to operate one set of pinch jaw units, and a third valve to actuate the remaining pinch jaw units.

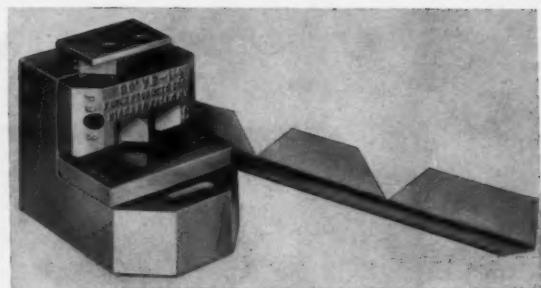
Pinch jaw units are of the float-



"Tangi-Matic" grinding-wheel dresser announced by Threadwell Tap & Die Co.



Cushman automatic air-operated jaws of pinch jaw chuck for horizontal spindle machines



Unipunch Series B, 90-degree vee-notching unit with finished work-piece

ing or compensating design and adjust automatically with the slightest resistance to the gripping surfaces of the work-piece. A maximum pinch of over 2000 pounds at 85-psi air pressure is possible for each pinch jaw unit. A non-lift feature has been incorporated in the design which eliminates time-consuming checks. Tests have shown that the amount of lift is held to less than 0.0002 inch per inch unit.

Circle Item 143 on postcard, page 255

### Unipunch Vee-Notching Units

Completely self-contained, Series B Unipunch, 90-degree vee-notching units for use in presses and press brakes have been announced by Punch Products Corporation, Niagara Falls, N. Y. These units are made in 5 1/2-

inch shut height and 2 19/32-inch die height for use in setups designed to notch both angle and sheet material equivalent to and including mild steel up to 1/8 inch thick. The units can be used on templates, T-slotted plates, and rails in presses or press brakes.

A group of these vee-notching units can be set up in any desired spacing arrangement in unlimited notching arrangements on up to three edges of sheets or along the edge of angles for multiple notching with each stroke of the press ram. The notching units can also be used in the same setups with Unipunch Series B perforating units for combination round and shaped hole-punching, corner-notching, and edge-notching in the same operation.

The Unipunch 90-degree vee-notching units are available from stock in two standard sizes for 1-

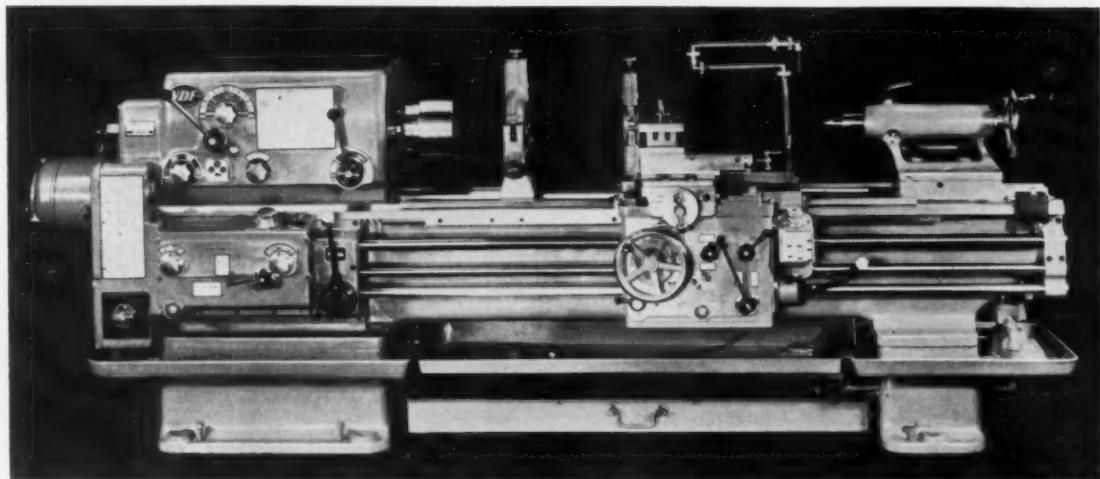
and 1 1/2-inch maximum depth vees. Units for larger size vees are available on request.

Circle Item 144 on postcard, page 255

### High-Precision Lathe Built in Three Sizes

Seewald, Inc., New Brunswick, N. J., announced its franchise in the United States for all VDF equipment built in Germany. The VDF standard high-precision lathe illustrated is being built in three sizes (S-400, S-450, and S-500) and is available in high-speed models with a top speed of 5600 rpm.

These lathes are designed to meet exacting requirements and have an exceptionally wide spindle-speed ratio (1 to 160 and 1 to 200) by direct belt transmission to the spindle at high speeds and gear drive at low speeds. The



VDF high-precision lathe introduced in this country by Seewald, Inc.

Seewald line will also include deep-hole boring machines, tube-turning lathes, bevel-gear generators, and planers.

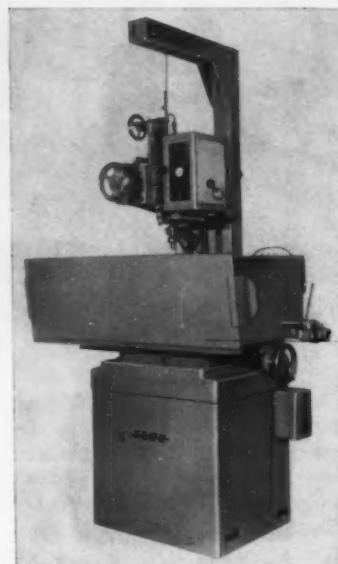
Circle Item 145 on postcard, page 255

### Elox "DieMatic" Electrical Cutting Tool

The Elox Corporation, Royal Oak, Mich., has brought out an M-501 "DieMatic" electrical energy metal-cutting tool designed specifically for use in machining forging, die-casting, blanking, extruding, and embossing dies. Since machining with this tool is completely automatic, one man can easily operate two or more units. Dies can be machined after hardening to avoid distortions normally caused by heat-treatment.

Any metal (regardless of hardness or density) can be machined economically, including soft steels and non-ferrous metals such as magnesium and aluminum. The DieMatic cutting tools can be machined, forged, extruded from free-machining brass, or cast from Elo-Met, an inexpensive low temperature alloy developed for this purpose.

The M-501 tool has longitudinal travel on the table, cross-slide travel on the over-arm, and vertical adjustment on the cross-slide assembly for easy adjustment of electrode to work-piece. A high-volume pump is supplied for fast filling of the work-table pan. The coolant filter is mounted on the outside of the machine base to facilitate changing filter elements. The power supply is a separate



"DieMatic" electrical cutting tool made by the Elox Corporation

unit mounted on casters which can be used on any machine tool that has been adapted for the Elox process.

Circle Item 146 on postcard, page 255

### Northwestern Aluminum Hand-Knobs

Two types of aluminum hand-knobs have been added to the standard lines of flanged nuts, quarter-turn screws, toggle shoe clamps, latch bolts, knurled head screws, V-pads, and other jig and fixture parts listed in the toolmaker's accessories and components catalogue of the North-

western Tool & Engineering Co., Dayton, Ohio.

The star type plain knob illustrated is available in five sizes with through-reamed or tapped holes ranging from  $1/4$  to  $5/8$  inch. The blind tapped or reamed hexagonal knob is available in four sizes with reamed or tapped holes ranging from  $3/8$  to  $3/4$  inch. These aluminum hand-knobs have a minimum tensile strength of 20,000 psi.

Circle Item 147 on postcard, page 255

### Rotary Dividing Table

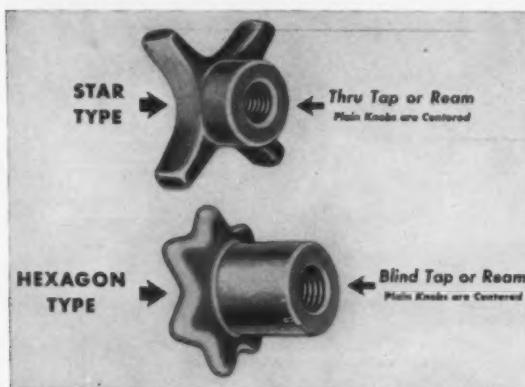
A complete line of imported Imperial precision circular dividing tables recommended for checking and lay-out operations as well as for use on jig borers and other machine tools is being introduced by Opto-Metric Tools, Inc., New York City. These tables are available in plain rotary and tilting types in seven different sizes between 10 and 40 inches in diameter.

The tables are graduated in degrees over the full circle of 360 degrees. Dial graduation is in 30 seconds of arc, and the vernier reading is in one second of arc. The large, easily read dial is graduated in one second of arc.

To insure constant accuracy, the tables are furnished with a circumferential compensating cam, whose contour is determined by optical testing. The dividing accuracy of these rotary tables is guaranteed to be within plus or minus 10 seconds of arc.

Circle Item 148 on postcard, page 255

(This section continued on page 230)



Aluminum hand-knobs added to line of components made by Northwestern Tool & Engineering Co.



Imperial rotary dividing head introduced by Opto-Metric Tools, Inc.



EX-CELL-O  
FOR  
PRECISION

An overall view of the Ex-Cell-O Style 432 Duplex Vertical Machine, used for finish facing, boring and chamfering automatic transmission housings.

2 These are stations #1 and #2 of the first of the three Style 432 machines. Part at left is semi-finishfaced, while part at right is finished on the opposite end by two tools each making one pass.

3 Close-up of housing during the finish face, bore and chamfer operations. Housings are permanent mold aluminum casting.

57-71

# Want Higher Production...?

Here's how one auto manufacturer did it

Urged by the upswing in automatic transmission demand, one of the "Big Three" installed several Ex-Cell-O Duplex Vertical Boring Machines. The two-station units rough and finish permanent mold aluminum torque converter housings at a rate of 164 per hour! Automatically, of course. Operations performed by this Style 432: turning, boring, facing, grooving and chamfering, alone, or in any combination.

Perhaps you have a volume production operation you would like to double at no increase in per-unit cost? Then you'll want to find out all about Ex-Cell-O Vertical Boring Machines. Their two-station construction auto-

matically doubles operator output. Get in touch with your local Ex-Cell-O Representative soon. Or, if you prefer, write direct to Ex-Cell-O, Detroit.

**EX-CELL-O**  
CORPORATION  
DETROIT 32, MICHIGAN

Machinery  
Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES  
CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG  
BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

## **Greaves Bench-Mounted Reamer Driver**

A bench-mounted reamer driver for reamers from 1/4 inch to 1 1/2 inches in diameter has been developed by the Greaves Machine Tool Co., Cincinnati, Ohio. This unit has four speeds—20, 32, 56, and 85 rpm—with higher speed ranges available on special order. Foot-switch operation leaves the operator's hands free to control the work, and convenient bench height facilitates work handling. Steady, low-speed rotation of the reamer driver assures smoothly reamed holes. Release of pressure on foot-switch stops rotation of the chuck.

The reamer driver has a 4-inch four-jaw universal chuck, and a three-jaw chuck is offered as optional equipment. The motor is wired for 110-volt alternating current. The mechanism (including motor) is fully enclosed and the gears run in oil. Bronze bearings and ball thrusts give long, trouble-free service. The reamer, including chuck, is 12 3/4 inches wide, 21 1/4 inches long, 9 3/4



**Greaves bench-mounted  
reamer driver**

inches high, and weighs approximately 125 pounds.

**Circle Item 149 on postcard, page 255**

## **Thompson "Hydra-Cool" Hydraulic System for Surface Grinders**

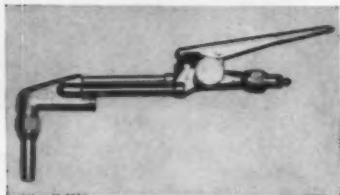
A hydraulic system that eliminates hydraulically generated heat at its source is announced by the Thompson Grinder Co., Springfield, Ohio. Extensive tests with this "Hydra-Cool" hydraulic sys-

tem for operating surface grinder tables have shown only a 3-degree temperature rise over ambient room temperature during continuous twenty-four hour production runs. This 3-degree rise is compared to temperature increases ranging from 50 to 70 degrees which prevail in conventional surface grinder hydraulic systems.

The Hydra-Cool system is of the pressure-compensating, variable-delivery type in which automatic compensation is applied to maintain oil delivery at the required volume and pressure. Since this compensation is automatic, no excess energy is ever present in the system to be wasted as heat. With heat eliminated at its source, the result is a hydraulic system that continuously operates at, or very slightly above, ambient temperatures.

Besides making it possible to maintain very close work tolerances on long continuous runs, the new system eliminates heat damage to seals, valves, and other components.

**Circle Item 152 on postcard, page 255**



## **Airco Light-Duty Oxy-Acetylene Cutting Attachment**

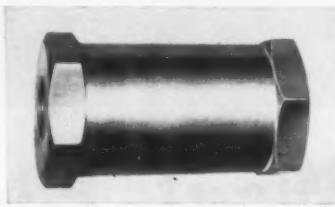
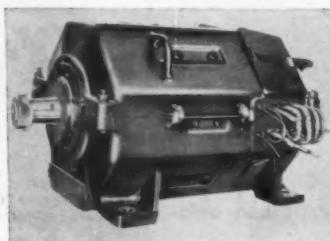
Light-duty oxy-acetylene cutting attachment, called Airco Style 1490, available from Air Reduction Sales Co., a division of Air Reduction Co., New York City. This unit can be attached to the Airco Style 400 lightweight welding torch. It weighs only 13 ounces, is 9 1/2 inches long, and will cut steel up to 1 inch thick. Tapered gas-sealing rings and hand-tightening make a firm gas-tight joint. A diaphragm type cutting oxygen valve eliminates the need for valve packing.

**Circle Item 150 on postcard, page 255**

## **Westinghouse Heavy-Duty Motor**

Heavy-duty, silicone-insulated mill motor, designated Type 620 mc, announced by Westinghouse Electric Corporation, Pittsburgh, Pa. Slightly larger than its predecessors, this motor retains such features as a cast-steel, split type frame; integral bearing and housing assemblies; large-diameter shaft between bearing supports; and compact mechanical design. The motor is available in 275-, 350- and 360-hp ratings.

**Circle Item 151 on postcard, page 255**



## **Ross Lightweight Check Valve**

Aluminum check valve weighing 4 ounces has been added to the line of equipment products offered by the Ross Operating Valve Co., Detroit, Mich. This valve is simply constructed, the poppet being the only moving part. Available in two models, 1/2- and 3/8-inch pipe sizes, the check valve has a differential cracking pressure of 1 psi maximum. Differential sealing pressure is less than 1 psi. The unit withstands operating pressures of up to 125 psi and temperatures up to 175 degrees F.

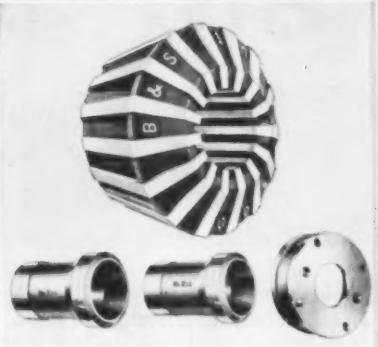
**Circle Item 153 on postcard, page 255**  
*(This section continued on page 232)*

# NOTICE

## to all users of Brown & Sharpe Screw Machines with $\frac{3}{4}$ " spindle capacity

Because of exceptional results obtained with Rubber-Flex\* Collets,  
we recommend that you USE RUBBER-FLEX COLLETS  
FOR HOLDING ROUND STOCK ON THE FOLLOWING MACHINES:

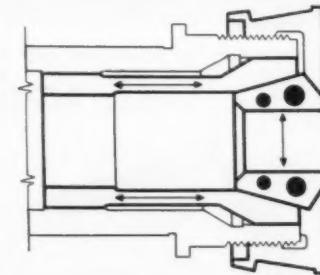
- A** All B&S Automatic Screw Machines of  $\frac{3}{4}$ " spindle capacity with Serial No. 2015 or higher. (Since 1914.)      **B** All B&S Hand Screw Machines of  $\frac{3}{4}$ " spindle capacity with Serial No. 540-0-1 or higher. (Since 1951.)  
(NOTE: Rubber-Flex Collets are furnished as standard equipment with new No. 2 Automatics of  $\frac{3}{4}$ " capacity.)



### NEW, DIFFERENT DESIGN

The Brown & Sharpe Rubber-Flex Collet is a permanent assembly, composed of hardened and ground steel jaws, separated and supported by special, oil-resistant synthetic rubber. It is used with a chuck nut and a chuck sleeve. When the sleeve is moved forward, it closes the jaws of the collet parallel on the work.

Extensive tests and customer production experience have shown that modern Rubber-Flex Collets cost less to use and perform better than any other collets available for use on the above machines. Here are the advantages you can expect from them:



### CUT COLLET INVENTORY WAY DOWN

Each Rubber-Flex Collet has a wide nominal range of .050". A set of only thirteen collets, two sleeves and a chuck nut handle any size of round stock within the capacity of the machines...from .093" to  $\frac{3}{4}$ "...and no "special" collets are needed.

### GRIP TIGHT AND CONCENTRICALLY

The parallel action of the long Rubber-Flex jaws gives them the strongest, most accurate

grip of any collet made. The grip actually increases as the power of the cut is increased, through a wedging action of the jaws.

### LAST UP TO 6 TIMES LONGER • THAN OTHER COLLETS

The jaws of this collet are long and can be held to maximum hardness, since spring temper is not required. They wear slowly and evenly because they bear parallel on the work.

### WILL NOT "STICK"

The Rubber-Flex Collet opens fast and cleanly every time. No production time is lost due to a sticking collet.

### SEAL OUT CHIPS AND COOLANT

This collet has no slots which will admit chip-laden coolant to vital spindle areas of the machines. It forms an hermetic rubber seal automatically against the chuck nut and around the work.

### PLAN NOW FOR GRADUAL REPLACEMENT

As your present collets for round stock wear out, we recommend that you change over to Brown & Sharpe Rubber-Flex Collets. Ask your Brown & Sharpe distributor for a demonstration. Brown & Sharpe Mfg. Co., Providence, R. I.

\*Trade-mark of the Jacobs Manufacturing Company, which makes these collets for Brown & Sharpe.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

**Brown & Sharpe** 

MILLING, GRINDING AND SCREW MACHINES, CUTTERS, MACHINE TOOL ACCESSORIES, PRECISION TOOLS, GEAR, VANE, AND CENTRIFUGAL PUMPS



### Cone-Drive Speed Reducer

One of four improved primary double-reduction gear units recently developed and added to the line of Cone-Drive double-envel-

oping worm gear speed reducers available from the Cone-Drive Division, Michigan Tool Co., Detroit, Mich. The new units are available in center distances of 2, 2 1/2, 3, and 3 1/2 inches. Coupled with the proper secondary unit, they provide reductions from 25 to 1 up to 3500 to 1. The new models are available with the worm over or under, or gear shaft vertical, in either right- or left-hand or double extended shaft assemblies to meet almost any installation requirement. Primary units from 2- through 3-inch center distances are new standard housings containing standard gear sets, bearings, caps, etc. Secondaries for these units are standard speed re-

ducers using standard stocked components. Water cooling coils can be installed in all sizes above 3-inch center distance for increased capacity. Primaries and secondaries are independently lubricated and have individual breathers, fillers, and oil level gages.

**Circle Item 154 on postcard, page 255**

### Cap-Screws with Nylok Self-Locking Inserts

Hexagon-head cap-screw with Nylok self-locking insert of the type recently added to the standard on-the-shelf fasteners manufactured and stocked by the Cleveland Cap Screw Co., Cleveland, Ohio. Avail-

### "Package Plan" Boring Equipment

Boring equipment introduced by Portage Double Quick, Inc., Akron, Ohio, in three "Package Plans" that include boring-bars, bar cartridges, and boring heads designed for convenience, efficiency, and economy. The "4-Some" package includes four boring-bars covering a range for boring holes of from 1 inch to 3 1/8 inches in diameter. Micrometer adjustment is made with individual adjusting wrenches for each bar. Micrometer scale is graduated in large, easy-to-read divisions. Bars are furnished with tool bit mounted at 53- or 90-degree angles. The boring-bar cartridge

package consists of three complete assemblies including cartridges, carbide-tipped tool bits, and wrenches. Tools are easily changed and removed for resharpening. Rigid clamping affords a tool that has no backlash in either direction. Cartridge assemblies are furnished to mount in boring-bars at 53- or 90-degree angles. At the lower left are shown the 2- and 3-inch diameter heads comprising the boring head "2-Some" package. Two long and two short tool bits offer a boring range of 2 3/4 to 5 1/4 inches in diameter.

**Circle Item 155 on postcard, page 255**



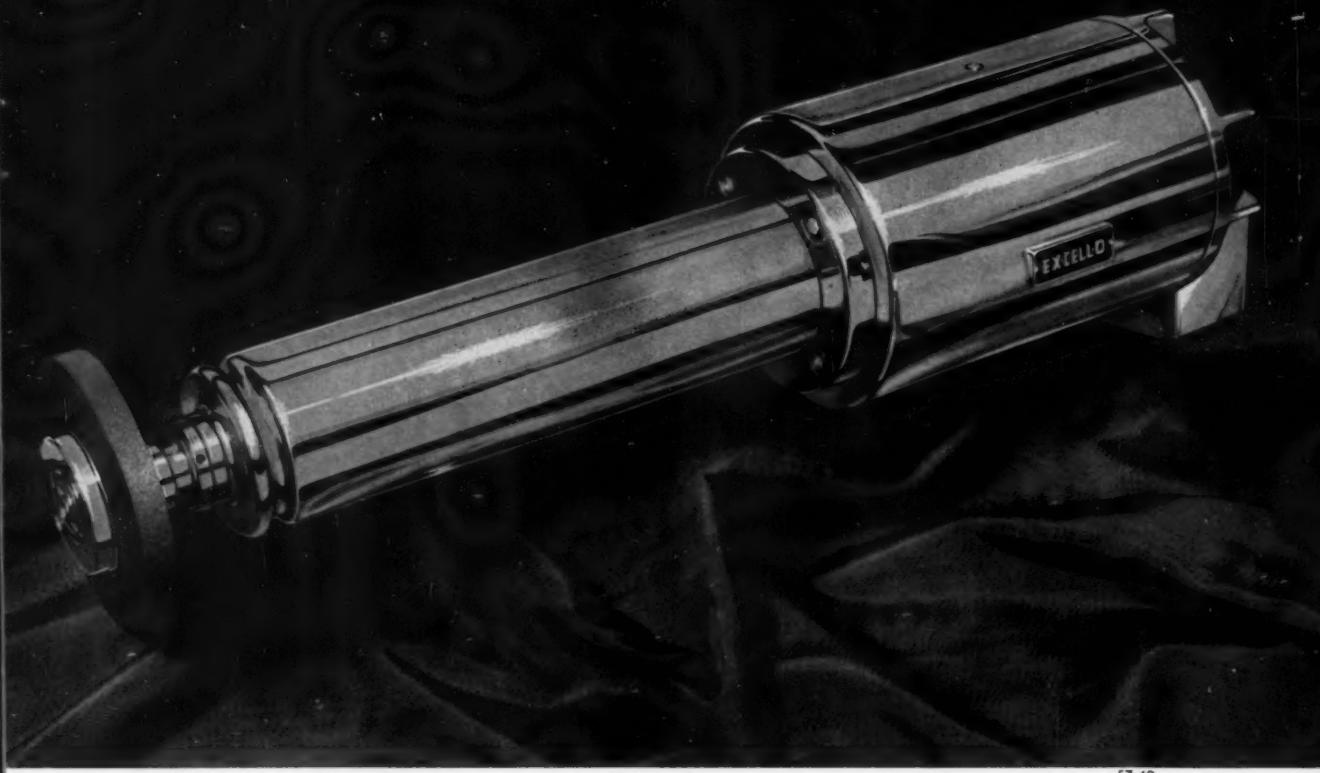
able diameters range from 1/4 to 1 inch. The cap-screws are made self-locking and self-sealing by means of a nylon pellet inserted in the threaded section of the screws. This patented process is said to prevent the cap-screws from working loose under the most severe vibrations, yet the screws can be removed and re-used. The nylon pellet is resistant to water, commercial solvents, alcohols, oil, and boiling 40 per cent caustic soda. It is practically ageless and will not rot, dry out, or shrink. Hexagon cap-screws with the Nylok inserts retain their locking action over a wide temperature range, from minus 70 degrees to plus 250 degrees F., even after repeated heating and cooling.

**Circle Item 156 on postcard, page 255**

*(This section continued on page 234)*



# 100,000



57-49

## Proof of Precision: This 100,000<sup>th</sup> Spindle

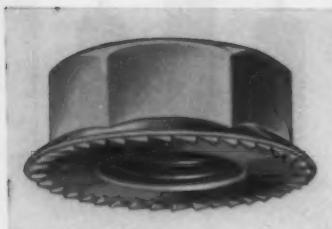
. . . that's right. Ex-Cell-O has produced more than 100,000 precision grinding and boring spindles. They are in use today throughout the world, on a wide variety of important jobs. No other spindle manufacturer has so solid a record for satisfaction—so sound a reputation for building the best.

**EX-CELL-O**  
CORPORATION  
DETROIT 32, MICHIGAN

EX-CELL-O FOR PRECISION **XLO**

Machinery Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT



### Spin-Lock Nuts

Spin-Lock nut which combines the function of nut and lock washer in one piece now available from Russell, Burdsall & Ward Bolt and Nut Co., Port Chester, N. Y. Available in sizes ranging from No. 8 to 1/2 inch, this nut has been designed to provide increased holding power. The ratchet-like structure on the base of the Spin-Lock nut bites into the bearing surface of the metal to be joined, resisting any tendency to loosen. Torque required to loosen the nut is actually greater than the tightening torque. The one-piece fastener can be assembled in a fraction of the time required for the conventional nut and lock washer. It need not be adjusted or positioned. The teeth provide good contact for electric equipment. These nuts are hardened to carry

heavy loads. The teeth are not deformed in use, and the nut may be re-used. Spin-Lock screws in a variety of head styles are also available.

**Circle Item 157 on postcard, page 255**

### Goddard & Goddard Carbide Face-Milling Cutter for Light Alloys

New series "Free Clear" carbide face-milling cutter for light metal alloys brought out by Goddard &



Goddard Co., Detroit, Mich. This cutter is designed for high-feed milling of flat surfaces requiring a good finish and clean edges. A high feed-per-tooth in machining

light metal alloys such as aluminum and magnesium is possible with this cutter because the corner angle of the carbide tip of the inserted blade does all the cutting. The cutters are regularly made in eight sizes for right- or left-hand cuts with outside diameters ranging from 8 1/4 to 18 inches and widths of 2 1/4 or 2 1/2 inches. Shell or shank integral type cutters can be made with outside diameters as small as 4 inches. The "crosslock" locking device permits accurate and fast blade adjustments as cutter diameters can be increased in 1/32-inch increments by setting out blades one serration.

**Circle Item 158 on postcard, page 255**

### Micrometer Adjustable Spacing Collars

Improved precision hardened and ground micrometer adjustable spacing collars for milling-machine cutter arbors brought out by the Dayton Rogers Mfg. Co., Minneapolis, Minn. The sizes

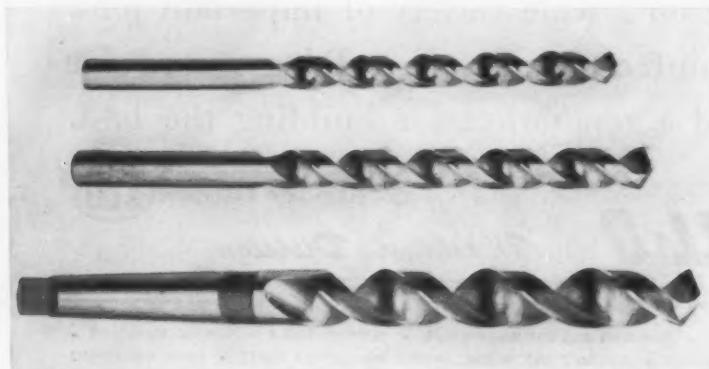


### Whitman & Barnes Taper

High-speed taper length drills of new series featuring "Fasttwist" flute construction announced by Whitman & Barnes, Plymouth, Mich. These "Fasttwist" type tools are recommended for drilling aluminum, magnesium, copper, die-cast metals, some of the plas-

tic materials, slate, and marble. Taper shank sizes readily available range from 1/8 to 3/4 inch. Straight shank taper length wire gage sizes range from 1 to 60; and straight shank taper length letter sizes, from A to Z.

**Circle Item 159 on postcard, page 255**



range from 5/8 inch to 3 inches for all standard cutter arbors. The outer barrel of the collar is so marked that it can be adjusted plus or minus against the thousandth graduations of the inner barrel with a spanner wrench furnished with the collar. The graduations are spaced to allow for 0.001-inch adjustment when the collars and cutters are placed on a given arbor.

**Circle Item 160 on postcard, page 255**  
(This section continued on page 240)

# General Mills said it about the Lindner Optical Jig Borer

"Machine time on the Lindner was 32 hours. Estimated time on any other machine or combination of machines in the shop was at least 64 hours, with serious doubts that the quality would have been as good."

## The Job:

Machining an optical test fixture for checking the hemisphere sight for the MD-9 Tail Defense System, used in the B-52 Bomber.

## The Specs:

- 1) Locating and boring bearing holes to  $\pm .0002$ ,  $-.0000$ ;
- 2) Locating and boring 49 additional holes for mounting optical lenses;
- 3) Milling a flat surface with first class microfinish around each hole to an angular position within  $\pm 2$  minutes.

## The Machine:

Lindner Optical Jig Borer, Model LB15A, with preselective Autopositioner®, used throughout for all locating and machining.

## need we say more?

Learn why Lindner Optical Jig Borers have changed so many ideas about jig boring. Send for a 25-minute movie film demonstration without obligation.

Lindner Optical Jig Borers are available in two models: LB15A with Autopositioner—Table size 44" x 24"; LB14—32" x 16" (without Autopositioner)



# KURT ORBAN

COMPANY, INC.

42 Exchange Place, Jersey City 2, N.J. • In Canada: 2490 Eglinton Ave. W, Toronto

ANNOUNCING!  
A NEW STARRETT  
HIGH SPEED STEEL BAND SAW

NEW  
**Starrett**  
SAFE-FLEX®

**HIGH SPEED STEEL BAND SAW**

CUTS UP TO 10 TIMES FASTER • LASTS UP TO 30 TIMES LONGER

The finest band saw available today, this new Starrett Safe-Flex® High Speed Steel Band Saw substantially lowers costs through faster cutting at higher speeds and heavier feeds, plus greater tool life and minimum metal removal.\*

It provides a cutting tool of highest quality *high speed steel*, heat treated by new techniques to produce a band of graduated hardness from super-hard teeth to a super-tough, flexible back. Ends are welded by new methods that produce a weld as strong as the parent metal. *Cuts Faster, Lasts Longer.* Exhaustive tests, in our own and steel company laboratories and in large plants in many industries, prove that the new Starrett Safe-Flex® High Speed Steel Band will cut up to 10 times faster with up to 30 times longer band life. You get continuous, high speed cutting with greatly reduced down time costs. Bands pay for themselves over and over.

**Red-Heat Hardness.** Red-heat hardness permits heavier feeds, higher speeds. This new band stays hard even at temperatures up to 1100° F. Greater tensile strength lets you use more tension, heavier feeds and higher speeds for faster, safer cutting of harder and tougher materials.

**Accurate, Efficient Cutting with Minimum Metal Removal.** Band thicknesses are only .025" to .042" — far thinner than other high speed cut-



ting tools. Extra thin section means faster cutting with less power and less chip loss — ideal for all cut-off work and for severing or slicing finished or semi-finished work.

Tooth and gullet design, engineered for maximum tooth strength, uniform stress distribution and efficient chip flow, plus sharper precision-cut teeth set with controlled accuracy, assures straight, accurate cutting with a fine finish.

Recommended for . . . Starrett Safe-Flex® High Speed Steel Bands are recommended for production cut-off work on tool and die steels and all ferrous alloys including: carbon steels, free machining steels, alloy steels, tool steels, stainless . . . also titanium and other hard-to-cut metals.

They are available through your Industrial Supply Distributor in Regular, Skip-Tooth and Hook-Tooth types in four widths and a wide variety of pitches. Call him for quality products, dependable service . . . or write for complete information. Address Dept. D, The L. S. Starrett Company, Athol, Mass., U.S.A.

\*When used on machines designed for high speed steel band saws.

**Starrett**

BAND SAWS • BAND KNIVES  
HACKSAWS • HOLE SAWS

*World's Greatest Toolmakers*



PRECISION TOOLS • DIAL INDICATORS • STEEL TAPES • GROUND FLAT STOCK • HACKSAWS • HOLE SAWS • BAND SAWS • BAND KNIVES

# MACHINERY'S DATA SHEET

## COMPOSITIONS OF UNLISTED COPPER ALLOYS (Cont.)

**Wrought Copper Alloys Not Listed in the Copper and Brass Research Association's Manual of Standard Alloys**

| Trade Name                          | Material                                      | Nominal Composition, Per Cent   | Forms and Applications  | Producer                                 |  |
|-------------------------------------|---|---|---|--|--|
| High-Strength Commercial Bronze 286 | Cu 90.25, Zn 6.90, Pb 1.75, Ni 1.00, P 0.10   | Rod, bar, tube—Pole line hardware and other parts subject to outdoor exposure.          | American Brass Co.  |  |  |
| High-Thermo                         | Modified Electrolytic Tough-Pitch Copper      | Cu 99.90 (Plus small quantity of an element added to increase resistance to annealing.) | Wire, bar, commutator section stock—High-conductivity electrical applications, as in transmission lines, bus-bars, commutator segments.                     | Phelps Dodge Copper Products Corporation |  |
| Hitenso—961                         | Cadmium Copper                                | Cu 99.00, Cd 1.00   | Sheet, strip, plate, wire, rod, bar—Electrical conductors, electrodes for resistance welding.   | American Brass Co.                       |  |
| Hitenso—965                         | Cadmium Bronze                                | Cu 98.60, Cd 0.80, Sn 0.60  | Wire, rod, bar—Wire and cable for electrical conductors.  | American Brass Co.                       |  |
| Leaded Bearing Bronze 116           | Cu 89.25, Sn 4.00, Pb 4.00, Zn 2.75           | Sheet, strip—Bearings and bushings in automobiles, aircraft.                            | Olin Mathieson Chemical Corporation   |  |  |
| Low-Leaded Bearing Alloy 605        | Cu 61.00, Zn 35.00, Mn 2.50, Si 1.00, Pb 0.50 | Rod—Screw machine products, hydraulic pump connecting-rod retainers.                    | Mueller Brass Co.   |  |  |
| Lubaloy—84                          | Tin Brass                                     | Cu 90.00, Zn 9.50, Sn 0.50  | Sheet, strip—Bearing alloy for bushings, bearings, clutch plates, thrust washers, jewelry, bezels, weatherstrips.   | Olin Mathieson Chemical Corporation      |  |
| Lubaloy—X80                         | Tin Brass                                     | Cu 90.00, Zn 8.25, Sn 1.75  | Sheet, strip—Radio tube socket contacts, fuse clips, contact springs, lock washers, solderless connectors, jewelry, coins, electric fan blades, medallions. | Olin Mathieson Chemical Corporation      |  |
| Manganese Brass 277                 | Manganese Brass                               | Cu 70.00, Zn 28.90, Mn 1.10   | Sheet, strip—Same physical characteristics as cartridge brass except for lower electrical conductivity, permitting easier Good for spot and seam welding.   | Olin Mathieson Chemical Corporation      |  |
| Manganese Cartridge Brass           | Manganese Cartridge Brass                     | Cu 70.00, Zn 28.75, Mn 1.25   | Strip—Fabricates as well as 70-30 brass, spot and seam welding.   | Bridgeport Brass Co.                     |  |
| Manganese Red Brass                 | Manganese Red Brass                           | Cu 81.00, Zn 17.75, Mn 1.25   | Strip—Spot and seam welding.  | Bridgeport Brass Co.                     |  |
| Manganese Red Brass 507             | Manganese Red Brass                           | Cu 85.00, Zn 14.00, Mn 1.00   | Sheet, strip, plate—Electrical resistance welding.  | American Brass Co.                       |  |

Based on Copper and Brass Research Association Data

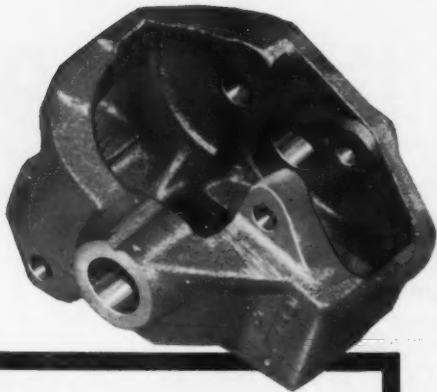
# MACHINERY'S DATA SHEET

## COMPOSITIONS OF UNLISTED COPPER ALLOYS (Cont.)

Wrought Copper Alloys Not Listed in the Copper and Brass Research Association's Manual of Standard Alloys

| Trade Name                                | Material                                      | Nominal Composition, Per Cent   | Forms and Applications  | Producer                                 |
|---|---|---|---|--|
| Medium-Leaded Bearing Alloy 602           | Cu 61.00, Zn 34.50, Mn 2.50, Si 1.00, Pb 1.00 | Rod—Screw machine products, shaft bushings.                             | Mueller Brass Co.   |  |
| Medium-Leaded Forgeable Bearing Alloy—603 | Cu 60.00, Zn 35.50, Mn 2.50, Pb 1.00, Si 1.00 | Forgings—Hydraulic transmission gears, hydraulic pump cylinder barrels. | Mueller Brass Co.   |  |
| Nittany—31                                | Leaded Brass                                  | Cu 62.00, Si 36.30, Pb 1.70   | Rod—Screw machine products requiring assembly operations, such as staking, turning over, etc.             | Titan Metal Co.                          |
| Non-Leaded Bearing Alloy 601              | Cu 61.00, Zn 35.50, Mn 2.50, Si 1.00          | Rod—Screw machine products.   | Mueller Brass Co.   |  |
| Phoenic Bronze                            | Nickel-Phosphorus Bronze                      | Cu 98.65, Ni 1.10, P 0.25   | Rod—Rivets, screws, springs, electrical parts.  | Chase Brass & Copper Co.                 |
| Silicon Red Brass 1027                    |   | Cu 82.00, Zn 17.00, Si 1.00   | Sheet, strip, plate, wire, rod, bar—Electrical resistance welding.  | American Brass Co.                       |
| Superloy                                  | Tin Brass                                     | Cu 88.00, Zn 10.00, Sn 2.00   | Tube—Condensers and heat exchangers.  | Phelps Dodge Copper Products Corporation |
| Tellurium Copper                          | Tellurium Copper                              | Cu 99.50, Te 0.50   | Rod—Screw machine and other parts requiring a high conductivity.  | Chase Brass & Copper Co.                 |
| Tellurium Copper—127                      | Tellurium Copper                              | Cu 99.50, Te 0.50   | Rod, bar, die-pressed forgings—Gas-cutting torch and welding tips.  | American Brass Co.                       |
| Telnic Bronze                             | Nickel-Phosphorus Bronze                      | Cu 98.15, Ni 1.10, Te 0.50, P 0.25                                      | Rod—Forgings and screw machine parts requiring high strength, good conductivity.                          | Chase Brass & Copper Co.                 |
| Tincosil—53                               | Extruded Nickel Silver                        | Cu 46.00, Zn 44.00, Ni 10.00  | Forgings—Plumbing, valves, instrument parts.  | Titan Metal Co.                          |
| Tincosil—54                               | Extruded Leaded Nickel Silver                 | Cu 47.00, Zn 38.75, Ni 10.00, Pb 2.25, Mn 2.00                          | Round and hexagon rod—Screw machine products, instrument parts, fishing tackle, valve and plumbing parts. | Titan Metal Co.                          |
| Trembronze                                | Tin Brass                                     | Cu 92.00, Zn 6.00, Sn 2.00  | Strip—General spring and contact applications in electrical and hardware field.                           | Miller Co.                               |

Based on Copper and Brass Research Association Data



ABOVE: Gear case after machining. Hole sizes are held within .0005", centers .001".

BELOW: This Ex-Cell-O Precision Two-Way Machine equipped to bore and chamfer cast-iron gear cases. Except for loading, clamping and unloading, this machine is entirely automatic.

# Lowers Cost of Gear Cases—Speeds Production!

## Ex-Cell-O 2-Way Machine



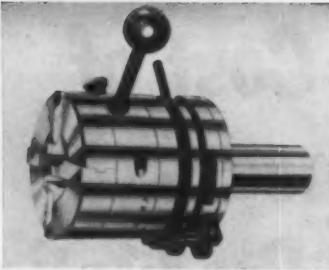
Typical of Ex-Cell-O's constant improvement in the field of precision production is this Two-Way Precision Boring Machine.

Operations on the cast-iron gear case illustrated include finish boring seven holes and chamfering diameters at two points. With its new hydraulic control panel each way unit has a greater range of feeds and a higher rate of rapid traverse.

Like all standard Ex-Cell-O Machines, this Two-Way Model is easily adapted at slight cost to a variety of precision setups. For further information, contact the Ex-Cell-O representative in your area, or write, wire or phone direct to Ex-Cell-O, Detroit.

**EX-CELL-O**  
CORPORATION  
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT



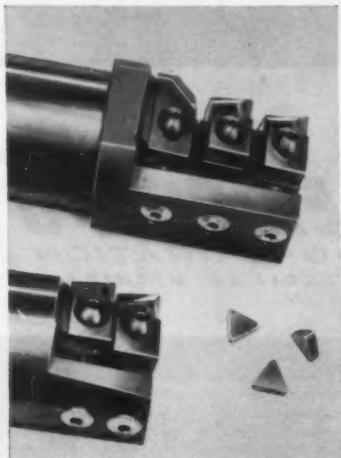
### Geometric Die-Head with Aligning Shank

Die-head of improved "DD" line announced by the Geometric Tool Co. Division, Greenfield Tap & Die Corporation, New Haven, Conn. These die-heads are available with aligning shanks having the same feature as the "DS" and recently announced "DSA" die-heads. This feature provides for properly aligning the die-head with the work to be threaded, which is essential for the cutting of accurate screw-threads. Shanks can be supplied in the flanged style as well as in the straight shank design shown.

Circle Item 161 on postcard, page 255

### Wesson Multi-Diameter Boring Tool

Micro-adjustable, multi-diameter boring tool made by the Wesson Co., Ferndale, Mich., to perform a combination of multi-diameter boring and chamfering operations. The throw-away inserts require no grinding. The anvil on which



each insert is locked is micro-adjustable in and out. Each division of the screw dials represents exactly 0.001 inch on the diameter. When the inserts are dull, they are simply indexed to a new and unused edge or interchanged.

Circle Item 162 on postcard, page 255

### Large-Size Unipunch Perforating Unit

Unipunch Series B-5 perforating unit—said to be the largest standard hole-punching unit—has been added to the hole-punching and



notching equipment made by the Punch Products Corporation, Niagara Falls, N. Y. It will punch round and shaped holes up to 3 1/2 inches in diameter in mild steel up to 1/8 inch thick. To facilitate easier handling of this unit, the 5-inch wide holder is made of a lightweight aluminum alloy casting with a steel insert in the guide hole to minimize wear and assure retention of concentricity. The Series B-5 perforating units are available in throat depths of 8, 12, and 16 inches.

Circle Item 163 on postcard, page 255

### Profiling Tool with "Throw-Away" Insert

Kendex profiling tool for contouring machines—said to be the first with "throw-away" inserts—for both roughing and finishing cuts, developed by Kennametal Inc., Latrobe, Pa. This profiling tool has a rigid support and clamp that hold the insert in the proper cutting position when direction of cutting forces changes as in plunge or "face-out" cuts. The tool assembly includes a chip-breaker plate, indexable insert, and insert seat, all solid carbides of different grades of Kennametal that are best suited to their functions. Inserts are of two general types,



right-hand and left-hand, and have two indexable cutting edges with a positive rake angle that minimizes power requirements and tool pressures. Holders, consisting of hardened alloy steel shank and clamp, are available in three types and eighteen sizes.

Circle Item 164 on postcard, page 255

### Midget Hi-Flow Centrifugal Pump

Vertical submerged type centrifugal pump, called Midget Hi-Flow, announced by the Brown & Sharpe Mfg. Co., Providence, R. I. The pump is equipped with an integral 1/8-hp, 3-phase, or 1/10-hp, single-phase motor. The motor is totally enclosed, with a NEMA standard flat face mounting, and



is built for continuous duty. The unit is designed for immersion in liquid to a depth of 5 3/4 inches with the motor mounted 2 inches above the maximum liquid level. The liquid flows from the impeller through two cored passages within the pump body, with a 1/2-inch pipe connection above the mounting flange. This pump is  
*(This section continued on page 242)*

# 50 lbs. oil pressure

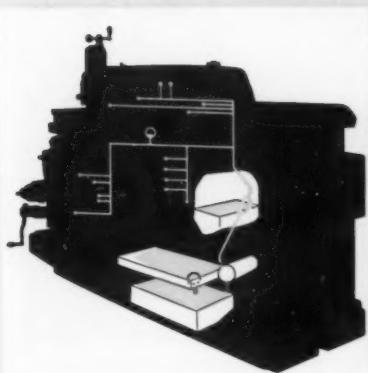
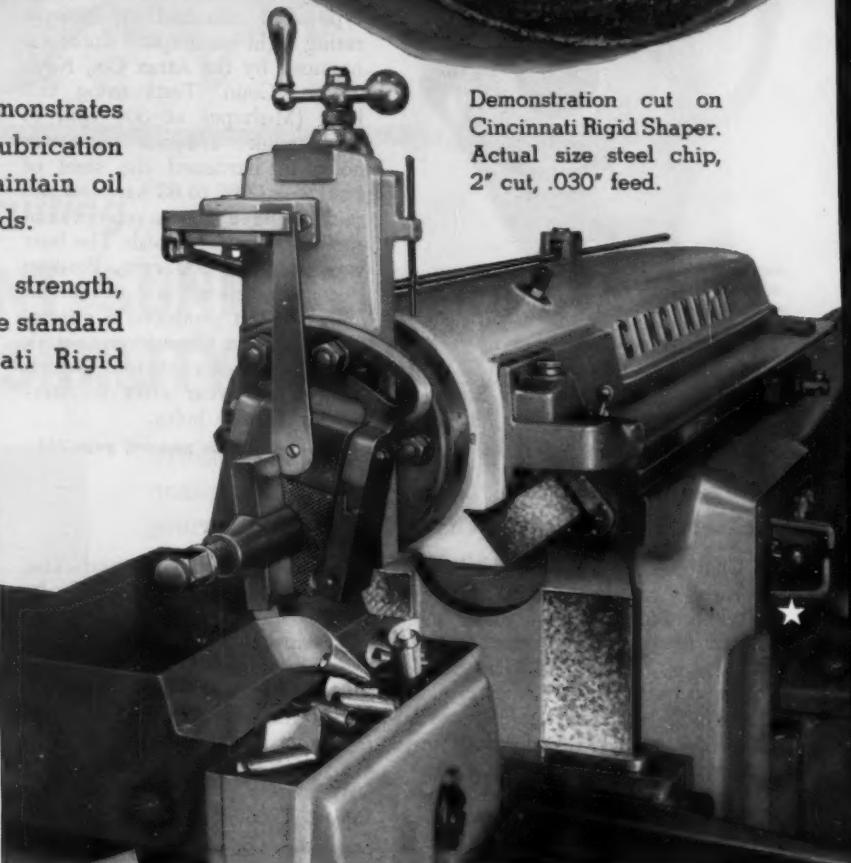
IS NECESSARY WITH  
A CUT LIKE THIS...



This tremendous cut demonstrates the ability of the 50 p. s. i. lubrication system to develop and maintain oil films under the heaviest loads.

It also demonstrates the strength, rigidity and power which are standard features on all Cincinnati Rigid Shapers.

Demonstration cut on  
Cincinnati Rigid Shaper.  
Actual size steel chip,  
.030" feed.



50 p.s.i. system includes 50 micro filter, settling basin and reservoir. Transmission runs submerged in oil.

- Write Department D for Bulletin "Cincinnati Rigid Shapers"



## THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • PRESS BRAKES

★ The Electro-Magnetic Brake and Clutch with finger tip control are standard features on Cincinnati Shapers for maximum speed and ease of operation.

suitable for supplying coolant for machine tools and light machinery, for use where dirt or abrasives may be present in the liquid, and for light transfer work.

Circle Item 165 on postcard, page 255

### Fraction-of-an-Inch Adding Machine

Fraction-of-an-inch adding machine in disc form that permits fast and accurate continuous adding or subtracting of fractions,



decimal equivalents, or mixed fractions and decimal equivalents is being distributed by Sheridan Advertising Specialties, Detroit, Mich. The machine has only one

moving part and is made from satin-finished aluminum. Numbers and lines are etched and filled with black enamel to give long service.

Circle Item 166 on postcard, page 255



### Atrax Spiral Flute Solid Carbide Burrs

Newly developed countersink type solid carbide burr, incorporating right-hand spiral flutes announced by the Atrax Co., Newington, Conn. Tests using this burr (M-shape) at 300 rpm to countersink 1/4-inch diameter holes in hardened die steel of Rockwell C 62 to 63 hardness are said to have shown exceptional speed and surface finish. The burr was used at 300 rpm. Positive shearing action and excellent chip ride-out produced a mirror-ground finish. Chamfer was sunk to full diameter of tool, which showed no wear after countersinking twenty holes.

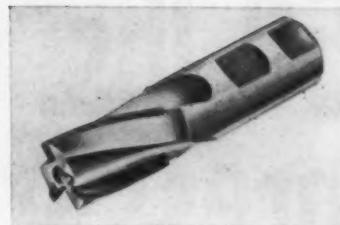
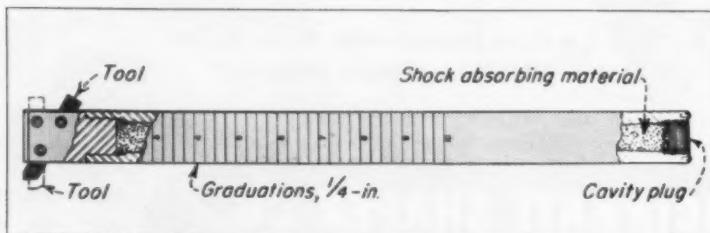
Circle Item 167 on postcard, page 255

### Pensco Chatterless Boring-Bar

Chatterless boring-bar, known as Silent Sam, designed to facilitate taking bigger and smoother cuts and handle work faster on any lathe or boring mill. The bar is bored out from each end to various sizes with the smallest size in the center of bar to diminish harmonic vibration to a minimum. These diameters were determined by using a vibration meter and probing bar at every quarter inch

to minimize such vibrations. The cavity is filled with a shock-absorbing material under a vacuum to produce a dead or vibrationless bar. The bar is made of a special alloy metal and graduated each quarter inch so that depth of bore is readily known without measuring with a scale. This new boring-bar is being manufactured by Pensco Products, New York City.

Circle Item 168 on postcard, page 255



### Helical Carbide-Tipped End-Mill

One of a new series of helical carbide-tipped end-mills for cutting at very high feeds and speeds is available from Goddard & Goddard Co., Detroit, Mich. The helical carbide cutting edges of this tool are formed by a special process that produces a true helix with a constant positive rake for the entire length of the tooth face. These features permit rapid milling of cast-iron and light metal alloys for which the tool was primarily designed. However, it can be used also for light cut milling of steels under good conditions of rigidity, feed, and speed. The cutters have straight shanks with flats for set-screws. The carbide tips are brazed to special high tensile steel cutter bodies. Standard stocked sizes range from 3/8 inch to 2 inches in diameter. Special sizes and designs are also available.

Circle Item 169 on postcard, page 255



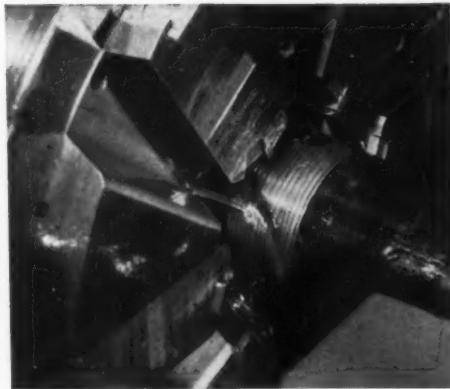
### Wheelco Electronic Multipoint Recorder

Series 8000 Wheelco electronic multipoint recorder that records up to sixteen points on one chart is announced by the Wheelco Instruments Division, Barber-Colman Co., Rockford, Ill. The recorder is designed for easy reading, long life, and trouble-



**For precision cutting ...**

## **TRANSPARENT SUNICUT OILS ASSURE YOU GOOD VISIBILITY, PEAK PRODUCTION**



Transparent Sunicut oils assure excellent finish in critical operations at close tolerances. Good visibility speeds production.

Transparent Sunicut® oils, including heavy-duty and dual-purpose oils, are available in many grades to suit your specific needs. They give outstanding results...especially where precision cutting is required.

Their transparency takes the "blinders" from work that needs close watching, permitting close product control, faster production, lower unit cost. Machine operators like Sunicut's "cleanliness." Most important, *transparent Sunicut oils assure you of good finishes.*

For full information about Sunicut cutting oils, call your Sun representative, or write to **SUN OIL COMPANY, Philadelphia 3, Pa., Dept. M-9.**

INDUSTRIAL PRODUCTS DEPARTMENT  
**SUN OIL COMPANY**  
Philadelphia 3, Pa.

In Canada: Sun Oil Company Limited, Toronto and Montreal

For more information fill in page number on Inquiry Card, on page 255



©Sun Oil Company

free service. Measurements may be obtained with sensing units such as thermocouples, radiation detectors, and other devices where the measured variable can be resolved into an electrical signal. Up to six limit switches may be incorporated to provide for high or low signal indication. The power supply is taken from a 115-volt, 50- or 60-cycle circuit, or a stepdown transformer is available which can be used for 230-volt applications.

**Circle Item 170 on postcard, page 255**

### Baldwin Strain Indicator

Baldwin Type N strain indicator of improved design announced by the Electronics & Instrumentation Division, Baldwin-Lima-Hamilton Corporation, Philadelphia, Pa. Printed circuits and transistors are being used in this instrument which is functionally equivalent to the Type M indicator, which it replaces. The Type N weighs only a third as much (9 pounds) as the Type M; is in a smaller case



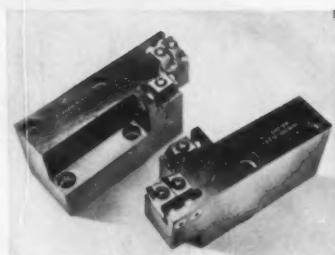
(10 inches high by 9 inches wide by 6 1/4 inches deep); and requires no warm-up period.

**Circle Item 171 on postcard, page 255**

### Nelco Carbide-Tipped Shell End-Mills

One of a new group of Series 400, three-flute, carbide-tipped shell end-mills recently announced by Nelco Tool Co., Inc., Manchester,

Conn. The end-mills in this line are for use with standard Type "C" arbors and have been designed for face-milling operations and to give a fine finish on aluminum, magnesium, brass or bronze alloys, and plastic materials. Carbide tips of substantial proportion are sandwich-brazed to the rugged alloy body, making a strong one-piece cutting tool for ultra-high speed operation. The three-tooth design allows more room for chip flow, and the odd tooth construc-

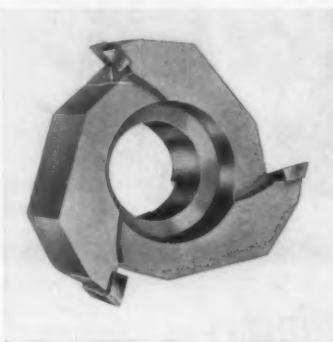


ferent cutting edges into use before being discarded. The arrangement eliminates all tool-grinding and greatly reduces tool changing and setup time.

**Circle Item 173 on postcard, page 255**

### DoALL End-Mill

"Controlled-Penetration" end-mill announced by the DoALL Co., Des Plaines, Ill., provides exceptional accuracy and long life for cutting tough, hard-to-machine materials such as titanium, stainless steel, and similar alloys. This end-mill contains grooves or notches that are accurately ground across the flutes. These grooves produce small ridges or lobes of material directly in the path of each tooth that facilitate the penetration of the cutting edges into the material. The resulting cut is said to have a smoother surface and better finish than that produced by ordinary end-mills. The new end-mill is available in a full

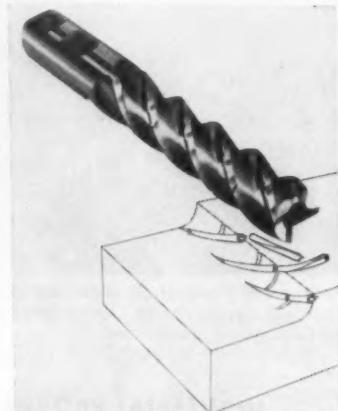


tion is said to result in a superior finish, especially when used on soft materials.

**Circle Item 172 on postcard, page 255**

### Wesson Micro-Adjustable Tool-Blocks

Micro-adjustable tool-blocks for throw-away Wessonmetal inserts added to the "throw-away tooling" line made by the Wesson Co., Detroit, Mich. These tool-blocks are particularly adapted for rough- and finish-turning and facing of high-production parts. The micro-adjustable feature facilitates setting up the tool for machining operations since an adjustment of one division on the head of the micro-adjustment screw advances or retracts the insert 0.001 inch. The typical tool-blocks shown are used as a pair to rough- and finish-turn two transmission parts simultaneously to a tolerance of plus or minus 0.0015 inch and also to face the parts. Once set, the tool-blocks require no further adjustment. When dull, inserts are simply indexed to a fresh cutting edge. Since square inserts are used, they can be indexed to bring eight dif-



range of sizes from 3/8 inch to 1 1/2 inches in the long flute type design.

**Circle Item 174 on postcard, page 255**



### B & S Precision Sine Plate

Sine plate for establishing precise angles for surface grinding, tool-making, and inspection brought out by the Brown & Sharpe Mfg. Co., Providence, R. I. This No. 925 5-inch sine plate, with an overall accuracy within 0.0002 inch, gives angular settings of gage-block accuracy. It is made of normalized steel, case-hardened and aged, with glass-like finish on bottom, top, and sides. The end plate is held in place by three knurled-head screws; and the sine plate itself has tapped holes in its sides, ends, and top for applying special plates or other holding devices. The working surface of the hinged plate is 3 1/2 by 6 inches, and the center distance between rolls is 5 inches.

Circle Item 175 on postcard, page 255

### Versa Foot Guard for Control Valve

Foot guard for use with all Versa pedal-actuated control valves made by Versa Products Co., Inc., Brooklyn, N. Y. This foot guard combines protection against accidental tripping of the valve as well as against injury of both the operator and actuating device. It can be used as a sturdy, portable supporting base for control valves that cannot be secured to the floor or to equipment, or it can be bolted down as a permanent installation. To facilitate installa-



tion, the guard base is equipped with all necessary base mounting holes, as well as threaded holes which coincide with the mounting holes on all Versa valves.

Circle Item 176 on postcard, page 255

### Ex-Cell-O Torque Actuator

Standard Model 6-3 "Rotac" torque actuator built by the Ex-Cell-O Corporation, Greenville, Ohio. Operating at 500 psi, this



unit is capable of producing a 280-degree circular travel. The fluid used is an ordinary hydraulic oil. External travel stops are provided and heavy-duty outboard bearings are employed to take the overhung bending load. This actuator is employed on a tube-bending machine built by Walter P. Hill, Inc., Detroit, Mich., which makes 180-degree bends in 2-inch lengths of thin-walled copper tubing having an outside diameter of 3/8 inch at the rate of 1500 pieces per hour.

Circle Item 177 on postcard, page 255

### G-E Magnetic Contactors and Motor Starters

All General Electric Size 0 and 1 magnetic contactors and motor starters in across-the-line, non-reversing, combination and reversing forms now meet the new NEMA standards for motor starters, according to an announcement by the General Purpose Control Department of the General Electric Co., Schenectady, N. Y. Size 0 starters are now rated for 5 hp at 440 to 600 volts and Size 1 starters are rated for 10 hp at 440 to 600 volts. Lower costs and small size are two advantages that

can be obtained from the re-ratings. Size 1 starter can now be used on some applications that formerly required Size 2. In many cases, Sizes 0 unit can now be used instead of Size 1.

Circle Item 178 on postcard, page 255

### Plastic Cover for Centerless Lapping Machine

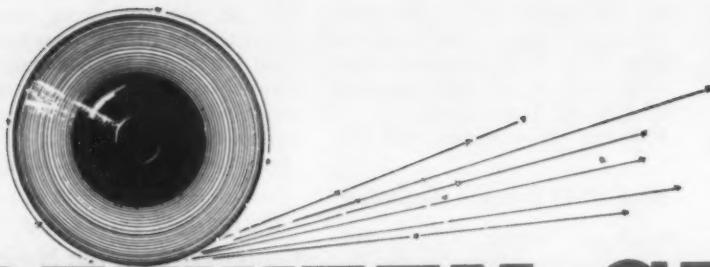
To provide maximum protection for the exposed working parts of its centerless lapping machines, the Size Control Co., Chicago, Ill., has developed a rigid plastic hood to be furnished at no additional cost with new machines manufactured by the company. The hood is also being offered for sale to the owners of previously purchased lapping machines. The new hood is molded of rugged polystyrene and then finished with a heavy steel band to afford maximum strength and protection against dust, dirt, and moisture. It also protects parts against damage.

Circle Item 179 on postcard, page 255

### Aireo Dual-Range Flowmeters

A new line of dual-range flowmeters is now being marketed by Air Reduction Sales Co., A Division of Air Reduction Co., Inc., New York City. Known as the 1600 Series, the flowmeters are designed for use in inert-gas welding, flushing molten metals, laboratory service, and many other industrial applications where accurate control and constant visual check of the flow rate of a gas is required. Flow ranges of these meters are sufficiently wide to meet gas demands formerly requiring more than one metering device. Rapid in-service switching from one flow range to another is done by means of a piston type selector valve. The flow rate within either range is controlled by a sensitive needle valve. The series includes seven direct-reading flowmeters, each for a specific gas, and one general-purpose flowmeter, provided with calibration curves, which will meter any of five gases. A combination of two or more flowmeters can be used to proportion a mixture of gases.

Circle Item 180 on postcard, page 255



By E. S. Salichs

# BETWEEN GRINDS

## Machine for Museum

The first abrasive surface grinder No. 3, handmade in 1916, is on permanent display in the Smithsonian Institution, Division of Engineering. In 1915, two machine-wise toolmen, Frank MacLeod and George Lant, hit upon the idea of a surface grinder utilizing a solid one-piece casting frame with the motor mounted inside the machine (features still employed by machine tool manufacturers the world over). A Yankee mechanic, Harry A. Flint, made practically every part that went into the pilot machine, assembled it, and performed the necessary experimental work. The machine spurred the founding of the Abrasive Machine Tool Co., of East Providence, R. I., which has prospered through three generations of MacLeod management and ownership.

## Go, Gavel, Go

An automatic gavel has been devised by Dave Choate, of Minneapolis-Honeywell, thus saving toastmasters' energies for the business at hand. Depressing a push-button trips

a switch, causing the gavel to strike an anvil. There is a built-in mood selector for speakers to choose from —Tired, Normal, Mad, Drop-Dead, and Apoplectic (the last incorporates a buzzer). Mr. Choate, besides being automation-minded, is retiring president of the Instrument Society of America's Wilmington Section. He has bequeathed the gavel to the incoming president.

## No Such Thing as a Free Punch

To cope with shady characters who erased pencil-marked railroad tickets for free rides, a practice was introduced more than a century ago of distinctive iron and steel punches for railroad conductors, *Steelways* tells us. Since there are more than 10,000 now in use, a collector's hobby has occurred to us. On a trip, ask the conductor for his punchograph.

## Neat Feat

A memory device has been developed by RCA that will enable electronic computers to store more than

a million bits of information in a space little larger than a shoe box, and to recall any or all of it in a few millionths of a second, according to the *Industrial Research Newsletter*.

## What Are You, A Man or a Moss?

This question was under consideration at a recent astronomical meeting. Strong evidence was brought out that a form of life might exist on Mars, more likely moss than man.

## A Story of Medical and Metallurgical Teamwork

A group of doctors from Wayne University Medical School worked with metallurgists and technicians at the Elgin National Watch Co. for several years to perfect the first metal spring ever used to repair the human heart, that of a young Detroit housewife. Surgeons estimate that the spring has already functioned over 38,000,000 times since it was placed inside her heart thirteen months ago. The spring was made of Elgiloy, the only material found compatible with human blood and tissue.



THE NEWTONS OF NORTHROP—These technicians, seemingly defying gravity, are actually standing on a sheet of aluminum alloy 3/32-inch thick, held under 6000-pound pressure between the jaws of a Sheridan Gray stretch press at Northrop Aircraft, Inc., Hawthorne, Calif. With this machine, extremely strong parts for the skin and other structural components of the USAF Northrop SM-62 Snark intercontinental guided missile are formed.



The Cleveland Automatic Machine Company  
4932 Beech Street  
Cincinnati 12, Ohio  
Attention: Mr. John Prohaska.

Gentlemen:

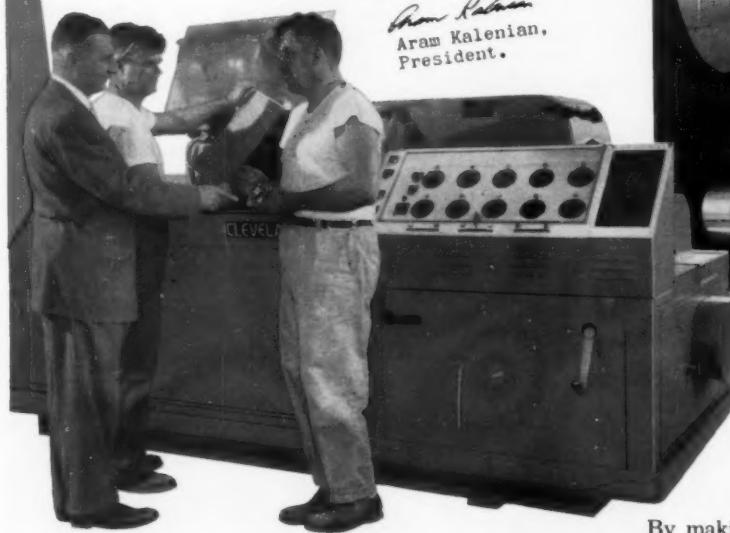
Our experience with our Cleveland 3" AB Automatic has been most gratifying. Its great versatility and accuracy as a chucker as well as a bar machine, coupled with its ease of set-up, due primarily to the use of universal cams and infinitely variable electronic feeds, and its low cost of maintenance has contributed greatly toward keeping our prices competitive and our quality high.

Because of its ease of set-up, we have used this machine to advantage on short runs of as few as 200 pieces as well as long runs of several thousand pieces.

Needless to say, we are extremely happy with our choice.

Very truly yours,  
VEE-ARC CORPORATION

*Aram Kalenian*  
Aram Kalenian,  
President.



Aram Kalenian, writer of the letter reproduced above, and president of Vee-Arc Corp., is shown with Ralph Rastad, superintendent, and Paul Daoust, operator, examining a chucking job run on their 3" Model AB Cleveland Dialmatic.

## WHAT THE CLEVELAND DIALMATIC DOES FOR VEE-ARC...

IT CAN  
DO FOR YOU!



The parts shown (some are blanked out, others are machined complete) are typical of those produced on the Model AB 3" Cleveland Single Spindle Automatic at the Vee-Arc Corp. Diameters of these parts range from  $\frac{5}{8}$ " to  $4\frac{1}{4}$ ", and materials include aluminum, type 303 stainless, and tough, cold hobbing steel.

By making use of the Cleveland's chucking attachment, which is quickly substituted for the bar stock feed assembly, the part shown at right is machined from blanks of  $4\frac{1}{4}$ " round aluminum bar stock in 98 seconds cycle time.

What the Cleveland Dialmatic does for Vee-Arc, it can do for you! Choose Clevelands to increase the production efficiency in your plant.

### THE CLEVELAND AUTOMATIC MACHINE COMPANY

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

For more information fill in page number on Inquiry Card, on page 255

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# News

## OF THE INDUSTRY

### California and Texas

JAMES BERÉ has been named president of Axelson Mfg. Co., a division of U. S. Industries, Inc., Los



James Beré, newly elected president of Axelson Mfg. Co.

Angeles, Calif. Mr. Beré joined Clearing Machine Corporation in 1946 and later became general manager of its Hamilton, Ohio plant. Clearing was acquired by U. S. Industries, Inc. in 1954, and in 1956 Mr. Beré was transferred to the Axelson division, serving as general manager until the present time.

W. H. MEYER and M. V. MILLS have joined the management staff of Shultz Steel Co., South Gate, Calif. Mr. Meyer assumes the duties of technical director. Mr. Mills is the new regional sales director assigned to serve the midwestern aircraft industries.

RICHARD W. MILLAR has been appointed to the board of directors of Turco Products, Inc., Los Angeles, Calif., manufacturer of industrial chemical processing compounds.

TORNQUIST MACHINERY CO., 3838 Santa Fe Ave., Los Angeles, Calif., has been appointed representative in the Southern California area for

MOTCH & MERRYWEATHER CO., Cleveland, Ohio.

ARCH C. SHAVER has been appointed general sales manager of Benchmaster Mfg. Co., Gardena, Calif.

AL LA COM has been appointed general sales manager of Collins Microflat Co., Hawthorne, Calif.

ROBERT L. ROSHONG has been appointed assistant to the quality control manager of Cameron Iron Works, Inc., Houston, Tex.

### Illinois and Wisconsin

ALLMETAL SCREW PRODUCTS CO., INC., Garden City, N. Y., announced the opening of a midwest division headquarters at 5611 W. Lake Street, Chicago, Ill. Tom Schaid will be in charge.

JOSEPH T. RYERSON & SON, INC., Chicago, Ill., announces the following appointments: FRANK E. KOLB was named manager, service division of the company's Chicago plant; WILFORD O. SCHWARTZ has been named sales manager for the company's St. Louis steel service plant; and STANLEY J. MILLER has been appointed assistant director of the company's engineering division.



(Left) Frank E. Kolb, manager, service division, and Wilford O. Schwartz, sales manager, St. Louis service plant of Joseph T. Ryerson & Son, Inc.

CLEARING MACHINE CORPORATION, division of U. S. Industries, Inc., Chicago, Ill., announces the following appointments: N. L. MAHLA has been named sales manager for the Cleveland district; DAVID W. BONNAR will serve as senior sales engineer in Detroit; and assistant sales managers in the Chicago area are TED GOELLER, LOU TUGLUS, and GLENN C. LECHLEITNER. WILLIAM ROWLETT has been transferred to the Sales Department and will be working out of the Detroit office. CARL BENSON, who had been covering the southern Ohio and West Virginia territory, is now operating out of the Philadelphia office as sales engineer. GAIL STIFLER, district sales representative, has been transferred from the Philadelphia area to the New York-New England area.

WESSON CO., Ferndale, Mich., announces the appointment of KEARNEY TOOL SALES, Rockford, Ill., as a distributor for the southern section of Wisconsin and the northern area of Illinois.

CHARLES A. MUELLER has been named chief engineer of the new Gas Process division of the Lindberg Engineering Co., Chicago, Ill.

R. J. KELLER has been named chief engineer of the A. O. Smith



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*— does 'em both!*

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Write for illustrated book with complete details.

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Corporation's Welding Products Division, Milwaukee, Wis.

### Michigan and Indiana

JOSEPH C. DRADER, a vice-president of Michigan Tool Co., Detroit, Mich., has retired. Mr. Drader has been heading the company's research work in the gear development field. This work will be carried on by HARRY PELPHREY who was recently appointed director of engineering research.

LOVEJOY & CO., INC., announces the opening of a newly constructed office and warehouse to serve the Detroit area. This new building is located at 23220 Pinewood Avenue, Warren, Mich., and will stock the complete line of Wheelock, Lovejoy Hy-ten, A.I.S.I., and S.A.E. alloy steels.

HYDRAULIC ACCESSORIES CO., Van Dyke, Mich., has formed a new division to handle its output of hydraulic valves. A national sales organization with headquarters at the main plant is being organized under the direction of TOM KING, national sales manager.

COLONIAL-ROMULUS DIVISION of the COLONIAL BROACH & MACHINE CO., Detroit, Mich., announces the appointment of three representatives: E. W. BROCK CO., 5657 Montgomery Road, Cincinnati, Ohio; EATON CO., 65 Zabriskie St., Hackensack, N. J.; GEOFFREY-LANE, INC., 432 E. First Ave., Denver, Colo.

MICHIGAN TOOL CO., Detroit, Mich., announces the appointment of P. D. BROWNE CO., Dallas, as sales and engineering representative in Texas.

SIZE CONTROL CO., Chicago, Ill., has appointed ERNEST E. DIENER CO., 4779 Korte Ave., Dearborn, Mich., as sales representative for the eastern half of the state of Michigan.

FORMSPRAG CO., Van Dyke, Mich., has appointed DODGE-NEWARK SUPPLY CO., INC., of Newark, N. J., as distributor of its products for northern New Jersey.

THOMAS W. KING has been appointed national sales manager for the Hydraulic Accessories Co., Van Dyke, Mich.

WILLIAM A. MINIX has been appointed chief gage engineer of the Freeland Gauge Co., Detroit, Mich.

WILLIAM R. WETZEL has joined the sales department of the Macklin Co., Jackson, Mich.

WHEELABRATOR CORPORATION, Mishawaka, Ind., announces the following administrative changes: JAMES F. CONNAUGHTON was elected to the newly created post of executive vice-president; HAROLD M. MILLER, who has been vice-president since 1944, was advanced to senior vice-president; JACOB A. SCHMIDT, JR., treasurer since 1952, is now secretary-treasurer; JOHN M. WOLF, assistant treasurer since 1955, was appointed controller; and EDWARD T. SULLIVAN was appointed assistant secretary-assistant treasurer. Officers who were re-elected are VERNE E. MINICH, honorary chairman of the board; OTTO A. PFAFF, president; LESLIE L. ANDRUS, vice-president; and STANLEY F. KRZESZEWSKI, vice-president.

### New England

NORTON CO., Worcester, Mass., announces the following appointments: IRWIN W. PETERSON has been appointed Detroit district manager of the company's Grinding Machine Division. He succeeds CLARENCE L. SMITH who retired; ALBERT G. GALLER was named a field engineer at the company's Teterboro, N. J., district office; and WINFIELD J. SCOTT was named abrasive engineer at Chicago.

GEORGE D. KLUMP has been named manager of manufacturing engineering for General Electric Company's Small Steam Turbine Department, Fitchburg, Mass.

J. E. BARBER has been appointed sales manager for Black & Webster, Inc., Newton, Mass.

ARTHUR R. MACNEIL, New England sales manager for MacDermid, Inc., Waterbury, Conn., has been named vice-president of the company. Mr. MacNeil will continue as New England sales manager along with his new duties. STANLEY S. KRENTEL, vice-president of MacDermid Western, has been named executive vice-president of MacDermid, Inc.

FREDERICK J. GARBARNO, formerly director of quality control for New Departure Division of General Motors Corporation, Bristol, Conn., has assumed the newly created position as the division's director of sales and engineering.

HARTFORD SPECIAL MACHINERY CO., Hartford, Conn., announces the appointment of HARVEY L. SPAUNBURG, JR. as manufacturing manager. JAMES J. JONES was named sales manager of the contract sales division.

ALFRED M. WINCHELL has been elected vice-president and a director of the Waterbury Pressed Metal Co., Waterbury, Conn.

### New York and New Jersey

DR. THORNTON C. FRY has been appointed vice-president and director of Univac Engineering for the Remington Rand Division of Sperry Rand Corporation, New York City. Dr. Fry was formerly assistant to the president of Bell Telephone Laboratories and in his new position with Remington Rand he will direct all research, development, and product planning of commercial and military Univac systems and equipment.

H. K. PORTER CO., INC., announces the appointment of E. G. COUNSELMAN as manager of industrial sales, with headquarters in New York City. WILLIAM E. HAINES, director of industrial defense, Department of Commerce, has been named to succeed Mr. Counselman as Washington representative.

HOWARD A. JOHNSTON, president of Marlin-Rockwell Corporation, Jamestown, N. Y., was elected president of the Anti-Friction Bearing Manufacturers Association. Other officers elected were: vice-president, R. S. Wood, general manager of Ball & Roller Division of the Link Belt Co., Indianapolis, Ind.; treasurer, E. B. THOMPSON, vice-president of



Fabian Bachrach

Howard A. Johnston, newly elected president of the Anti-Friction Bearing Manufacturers Association.

# V-R Carbides for Milling ...A Grade for Every Application

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| SOLID MILLING CUTTER BLADES            |  | 2A5   | A grade exhibiting an excellent balance of strength and resistance to abrasion. For general purpose milling of cast iron, hardened steels, and non-ferrous metals. |
| CARBIDE TIPS FOR BLADES                |  | 2A68  | A strong, tough wear-resistant grade for roughing cuts on cast iron, non-ferrous and non-metallic materials with heavy feeds, and interrupted cuts.                |
| SOLID HELICAL BLADES AND SPECIALS      |  | EE  | A hard, strong grade for roughing and interrupted cuts in milling carbon and alloy steels, either rolled or cast.  |
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|  |  | <p><b>First Consideration for Efficient Milling<br/>is the Use of Carbide Cutters and Selection<br/>of the Correct Grade for the Job</b></p>  |  |
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|  |  | <p>This is where Vascoloy-Ramet field engineers enter the picture. They offer a complete line of V-R quality carbides to best suit each milling operation and they have the know-how to help you select the grade that will give maximum results on your job. The chart above indicates the factors to be considered.</p> |  |
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|  |  | <p><b>SEND FOR V-R CARBIDE CATALOG</b></p> <p>This 44-page catalog gives complete data on V-R carbide grades for milling cutter tips and blades as well as for all general machining applications. Write today.</p>   |  |



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sales at Torrington Co., Torrington, Conn.; and HARRY SMITH, permanent secretary and manager of the association.

CARBORUNDUM COMPANY, Niagara Falls, N. Y., announced three promotions in their finance and engineering divisions. GEORGE J. ZIMMERMAN was elected controller; GILBERT J. STEWART was elected treasurer of the company and its U. S., Canadian, and Australian subsidiaries; and EARL WILSON, formerly acting controller of the Bonded Abrasives Division, was elected assistant controller of the company.

HOUDAILLE INDUSTRIES, INC., announces the appointment of ROBERT L. STRAWBRIDGE as vice-president and general manager of the Wales-Strippit Co., Akron, N. Y., a unit of the company. RUSSELL A. JOHNSON was appointed sales manager.

GEORGE E. DRAKE has been appointed vice-president in charge of sales of Electro Metallurgical Co., division of Union Carbide Corporation, New York City.

T. R. CALLAHAN has been appointed midwestern sales representative by the Watson-Stillman Press Division, Farrel-Birmingham Co., Inc., Roselle, N. J. Prior to this recent appointment Mr. Callahan represented the company in the Buffalo-Rochester area.

## Ohio

RELIANCE ELECTRIC & ENGINEERING CO., Cleveland, Ohio, announces the appointment of four officers—three of operations groups and one in marketing. Elected vice-presidents



Richard A. Geuder, vice-president of marketing, Reliance Electric & Engineering Co.



John H. Diehl, general manager of Rockwell Manufacturing Co., Power Tool Division.

of operations groups were WILLIAM R. HOUGH, WALTER H. HABER, and HUGH D. LUKE; and to the office of vice-president of marketing, RICHARD A. GEUDER. Mr. Hough is also vice-president of engineering. JAY W. PICKING has been named manager of the company's Control Division in Euclid and EARL C. BARNES became chief engineer of the company, both reporting to WILLIAM R. HOUGH. KARL H. MEYER was appointed manager of manufacturing services at the company's headquarters and JONATHAN L. COLLENS was named assistant division manager of the company's Ivanhoe Division. Both Mr. Meyer and Mr. Collens will report to HUGH D. LUKE. DON E. BOUFFARD has been named manufacturing manager of the company's Ashtabula Division and RALPH G. DAVIS was named assistant division manager, reporting to WALTER H. HABER.

JOHN H. DIEHL, assistant to the vice-president in charge of Rockwell Manufacturing Company's Power Tool Division, has been named general manager of the recently expanded Bellefontaine, Ohio, power tool plant. Mr. Diehl spent five years as engineering co-ordinator and six years as assistant works manager of the LaPorte, Ind., plant of Allis-Chalmers Manufacturing Co.

COLONEL WILLIAM J. DARMODY will take charge of Sheffield Corporation's Dayton, Ohio, basic and advanced metrology and measurement standards research. Colonel Darmody is the retired chief of the Army Ordnance Gage Center at Frankford Arsenal and former mechanical engineer with the National Bureau of Standards.

REACTIVE METALS, INC., is constructing a multi-million dollar zirc-



(Left to right) William R. Hough, Walter H. Haber, and Hugh D. Luke, newly appointed vice-presidents of operations of Reliance Electric & Engineering Co.

nium melting plant in Ashtabula, Ohio. Scheduled to begin production in September, the plant will represent the largest domestic facility for melting of zirconium.

**ARTHUR S. GOULD**, director and vice-president in charge of sales of the Oster Mfg. Co., Wickliffe, Ohio, announced his retirement after fifty years of service with the company. At the same time **LESTER D. MARTIN** was made vice-president.

**HYDRAULIC PRESS MFG. CO.**, a division of Koehring Co., Mt. Gilead, Ohio, has acquired the **HENRY & WRIGHT DIVISION OF EHMART MFG. CO.**, Hartford, Conn.

**PRODUCTION TOOL CO.**, 2479 Lee Blvd., Cleveland, Ohio, has been appointed sales representative in northern Ohio for products of the Taft Peirce Manufacturing Co. of Woonsocket, R. I.

**RALPH V. LITTLE, JR.** has been appointed manager of the Product Engineering Department of Brush Electronics Co., Cleveland, Ohio, a division of Clevite Corporation.

**FRANCIS P. FLITNER** has been appointed manager of the San Jose, Calif., branch of the DeVilbiss Co., Toledo, Ohio.

**W. F. MERICLE** has joined the sales staff of the Cincinnati Shaper Co., Cincinnati, Ohio, in the capacity of export sales manager.

**REGINALD G. SCHULER** has been named general engineering manager of Brush Electronics Co., Cleveland, Ohio.

### Pennsylvania and Florida

**CARPENTER STEEL CO.**, Reading, Pa., announces the following appointments: **DOUGLAS R. BEGGS**, former assistant to the vice-president of production, has been appointed general superintendent of the Reading plant. **FOSTER W. EVANS**, formerly superintendent of production control, has become production manager. **HAROLD W. MILLER**, who continues as head of the company's engineering department, has been given the responsibility of coordinating all engineering functions including electrical and mechanical maintenance. **GEORGE BENNETHUM**, has been appointed assistant manager of alloy steel sales and **T. ALLEN WASHBURN** has been named assistant manager of tool steel sales.



**Robert W. Frank**, vice-president of Birdsboro Steel Foundry & Machine Co.

**ROBERT W. FRANK** has been elected vice-president of Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa. Mr. Frank was formerly vice-president of mill machinery sales of the Blaw-Knox Co. Prior to Blaw-Knox's recent merger with Continental Foundry & Machine Co., he was president and general manager of the Lewis Foundry & Machine division of Blaw-Knox.

**BALDWIN-LIMA-HAMILTON CORPORATION**, Philadelphia, Pa., announces that the following companies have been appointed as representatives: In New York State, A. V. Wiggins Co., Inc. has been appointed Syracuse area dealer, and Ogden R. Adams, Inc. was named Rochester area sales distributor; and R. L. Crane Machinery Co. has been named Buffalo-Jamestown, N. Y. area sales distributor. H. J. Weber & Co., Chicago, Ill., has been named distributor for the company's presses made by the Hamilton Division, Hamilton, Ohio. At the same time it was announced that the company has opened a sales office in Schenectady, N. Y., to give fast sales service throughout the state of New York.

**CRUCIBLE STEEL COMPANY OF AMERICA**, Pittsburgh, Pa., announces the appointments of **C. J. RYAN** as assistant to the vice-president of sales with headquarters in Detroit; **J. J. WYCALL** as manager of the company's St. Louis sales branch; and of **CHARLES D. PREUSCH** as chief metallurgist of its Spaulding Works in Harrison, N. J. It was also announced that Dr. **ROBERT W. LINDSAY** will join the staff of the company's Central Research Laboratory in Pittsburgh, Pa. The company has recently opened a stainless steel sales

office and warehouse building at 3400 Malone Drive, Chamblee, Ga. The warehouse is built on a 4 1/2-acre site and has a 20,000-square-foot storage area plus 5400 square feet of sales office space. A specialty steel warehouse was opened at 4501 W. Cortland St., Chicago, Ill.

**ALLEGHENY LUDLUM STEEL CORPORATION**, Pittsburgh, Pa., announces the opening of a tool steel warehouse at 155 Washington St., Newark, N. J., to serve the New York sales territory of the company. A complete staff and office will be located at the warehouse. These facilities are in addition to the company's offices located at the New York District Sales Office in the Socony-Mobil Building, New York City.

**SUPERIOR TUBE CO.**, Norristown, Pa., has authorized construction of a new office building and factory addition at its general offices and main plant on Germantown Pike, 17 miles northwest of Philadelphia. Cost of construction, equipment, and furnishings will be about two million dollars. The project is part of the company's \$5,000,000 expansion program which began in 1956.

**MINNEAPOLIS-HONEYWELL REGULATOR CO.**, has opened a new plant for the production of industrial valves at Fort Washington, Pa. The 120,000-square-foot plant, located on a 25-acre site in Fort Washington's Industrial Park, provides manufacturing, research and development, sales, and administrative facilities for the Valve Division.

**J. KEITH LOUDEN** has been appointed vice-president, director, and chief executive officer of the Lebanon Steel Foundry, Lebanon, Pa.

**CLEMENT N. WILLIAMS** has been appointed sales and service representative for Lewis-Shepard Products, Inc., Watertown, Mass., in the Miami, Fla. area. Mr. Williams will maintain complete sales and service facilities at 6821 Sunset Drive, South Miami, Fla.

**LATROBE STEEL CO.**, Latrobe, Pa., announces the opening of its Southern regional warehouse and office located at 4342 E. 10th Court, Hialeah, Fla.

**CAMERON & BARKLEY CO.**, 1939 Hendricks Ave., Jacksonville, Fla., has been appointed distributor for **NIAGARA MACHINE & TOOL WORKS** in South Carolina and Florida.

*(This section continued on page 260)*

**Any Welding Job  
AC or DC can  
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*This job required DC welding . . . The next job needed AC.*

**W**ITH Lincoln Idealarcs you can schedule any welding job on any machine. You can take any machine to any job. You can do these things because every Idealarc can give you both AC and DC welding current . . . whichever is best for the particular job.

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*The World's Largest Manufacturer of Arc Welding Equipment*



*Idealarc AC/DC Welder available in  
180, 250, 300, 400, 500 amp. sizes.*

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**H**as

both AC

and DC

**Y**et costs

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On New Shop Equipment described in the editorial pages  
On products shown in the advertisements**

## NEW CATALOGUES

**BEARINGS**—Aetna Ball and Roller Bearing Co., Chicago, Ill. 88-page general catalogue and engineering manual. Included is an engineering data section to correlate Anti-Friction Bearing Manufacturers Association terminology with Aetna designs; how to select ball thrust bearings; how to calculate thrust load capacities; how parallelism and flatness affect thrust bearing performance; fits and tolerances; formulas for calculating thrust loads for various gear drives; oil and grease lubrication methods; and how to handle and care for bearings. A section is also included on the company's line of sealed, pre-lubricated ball bearing "package" units, which can be used as adapter bearings, sprocket idler units, belt idler units and in other applications with stationary flange type housings. (This section has also been issued as a separate edition, designated AG-57.) Copies of this catalogue, as well as the general catalogue, can be obtained free of charge from Aetna Ball & Roller Bearing Co., 4600 Schubert Ave., Chicago 30, Ill.

**STAINLESS-STEEL DATA**—Allen Mfg. Co., Hartford, Conn. 16-page bulletin entitled "Stainless Steel Data," presenting information on stainless steels. Characteristics of the three major types of stainless steels are outlined, together with their advantages in various kinds of applications. In a compact reference table, characteristics of these steels at elevated temperatures are detailed as to strength and toughness, scale resistance, grain growth and structural changes, and corrosion resistance. A section is devoted to special metal finishes and treatments available on the company's stainless-steel hex-socket screws. ....1

**SHANK END-MILLS**—Brown & Sharpe Mfg. Co., Providence, R. I. Leaflet describing the company's new line of heavy-duty end-mills with 2-inch diameter shanks to be used in such operations as tracer-controlled milling. Available in two-, three-, and six-flute as well as ball-end styles, these end-mills have polished flutes, high helix, and efficient rake angles. Eccentric relief sharpening produces a finer quality cutting edge. A new adapter accommodates these end-mills for use on milling machines. ....2

**AUTOMATIC LUBRICATION**—Bijur Lubricating Corporation, Rochelle Park, N. J. 4-page bulletin entitled "The A.B.C. of Modern Lubrication," describing and illustrating the three basic elements of automatic lubrication—lubricators, distribution systems, and meter units. Eight types of automatic lubricators are shown. Distribution system details—including information on the variety of tubing, junctions, flexible hose—are given. ....3

**TITANIUM CARBIDE ALLOYS**—Kennametal, Inc., Latrobe, Pa. Bulletin B-444, describing the company's heat-resistant titanium carbide alloys and their applications in the metalworking industries. Shown are parts of simple and complex shapes that have been successfully used at temperatures ranging to above 1800 degrees F. Physical properties of thirteen different compositions and corrosion resistance are tabulated and charted to show the effect of temperature and time of exposure. ....4

**CARBIDE TOOLS**—Super Tool Co., division of Van Norman Industries, Inc., Detroit, Mich. 36-page catalogue including details and prices on the company's line of carbide-tipped drills, reamers, end-mills, countersinks, milling cutters, counterbores, and centers. Additions to the line and also included in the catalogue are chatterless countersinks, solid carbide

center laps, and solid carbide flute chucking reamers. ....5

**AIR FILTERS**—American Air Filter Co., Inc., Louisville, Ky. Bulletin 274B, describing the company's dynamic precipitator. Its distinguishing feature is the addition of a water spray to the basic principle of dynamic precipitation. The spray maintains a flowing film of water on collecting surfaces which lowers the water requirements to a minimum, traps fine dust particles, and delivers collected dust in slurry form for disposal. ....6

**ABRASIVE BLAST CLEANING MACHINES**—Wheelabrator Corporation, Mishawaka, Ind. Four bulletins describing Wheelabrator continuous Tumbblast airless abrasive blast cleaning machines. Covered are the 15-, 30-, 48-, and 60-inch machines with end-discharge construction in which work to be cleaned passes through the machine at a continuous rate. Each bulletin is filled with graphic illustrations of construction and design features. ....7

**CORROSION CONTROL**—Minnesota Mining & Mfg. Co., St. Paul, Minn. 4-page folder describing halofluorocarbon dispersion coatings for industrial corrosion control and contamination prevention. Chemical resistance, thermal stability, toughness and flexibility, abrasion resistance, dielectric strength, and anti-

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sticking surfaces are included in the combination of properties offered by this system. .... 8

**GAS FORK TRUCKS**—Baker-Raulang Co., Cleveland, Ohio. Two bulletins describing gasoline- or LPG-powered fork lift trucks with capacities of 5000 and 6000 pounds. Features of the trucks include engine, transmission, and drive axle coupled into an integral unit, absence of cowl for good visibility, and self-equalizing brakes with single-point adjustment. .... 9

**AIR-OPERATED CHUCKS**—Cushman Chuck Co., Hartford, Conn. Ring-bound catalogue P. O. 65, describing the company's line of air-operated chucks, cylinders, and accessory equipment. The catalogue is divided into sections to provide a quick reference to chuck or cylinder descriptions, dimensions, part lists, accessories, and general information on the company's products. .... 10

**MICRO-SIZE SELF-LOCKING NUTS**—Standard Pressed Steel Co., Flexloc Lock-nut Division, Jenkintown, Pa. 4-page bulletin describing the company's miniature precision lock-nuts designed for scientific and industrial instruments, electronic equipment, and other applications where weight and size are important factors. Flexloc self-locking nuts and clinch nuts range in size from No. 0 to No. 4 diameter. .... 11

**OILLESS BEARINGS**—Arguto Oilless Bearing Co., Philadelphia, Pa. 24-page illustrated catalogue including specifica-

tions, list sizes, and operating characteristics of the company's standard conveyor roll bearings as well as self-sealing, free draining and conical bearings for use on belt, live roller, gravity roller and special conveyors. .... 12

**PRECISION LATHES**—Sheldon Machine Co., Inc., Chicago, Ill. Catalogue 5-31-57, illustrating and describing the company's Series 11 and 13 variable-speed precision lathes. Complete specifications and detailed information on variable drive and other design features are included. These lathes provide automatic power selection of spindle speeds from 40 to 2000 rpm. .... 13

**AIRCRAFT FASTENERS**—Standard Pressed Steel Co., Jenkintown, Pa. Folder 2245, describing the company's line of precision, high-strength aircraft fasteners for airframe engines. Included are both tension and shear fasteners for weight-saving, temperature, and heavy-load applications; all-metal, one-piece self-locking nuts; and a preload-indicating washer, called the PLI-washer. .... 14

**METAL-FORMING MACHINERY**—Struthers Wells Corporation, Titusville, Pa. Bulletins 5610 and 956, describing the company's tangent benders, roller tables, and tumble die-bending machines, punching and notching machines, special sheet-metal forming dies, and special machines. Bulletin 5610 deals with punching and notching machines. .... 15

**WELDING POSITIONERS**—Aronson Machine Co., Arcade, New York. 12-page

bulletin featuring the company's headstock and tailstock positioners. Eight models ranging in capacities from 5000 to 160,000 lbs. are described. Complete data on each model plus a page of comprehensive specifications and quality features are included. .... 16

**WIRES**—Colorado Fuel & Iron Corporation. 72-page illustrated catalogue describing the company's complete line of Wickwire wire. Complete ordering specifications for all wires include low-carbon coarse wire, high-carbon fine and specialty wire, low-carbon fine and specialty wire, and flat and shaped wire. .... 17

**HYDRAULIC ACCUMULATORS**—Parker Appliance Co., Cleveland, Ohio. 36-page catalogue describing the company's line of piston type accumulators for hydraulic service. The line includes 14 models ranging in oil capacity from 10 cubic inches to 10 gallons, and four inside diameter sizes ranging from 2 to 7 inches. .... 18

**MEASURING DEVICES**—Size Control Co., Chicago, Ill. Catalogue describing the company's measuring devices. Among the items listed are reversible, plain, and thread plug gages; thread ring gages and setting plugs; adjustable limit snap gages; ring gages and master setting discs; thread- and gear-measuring wires; and centerless lapping machines. .... 19

**DIE SETS**—E. W. Bliss Co., Die Supply Division, Cleveland, Ohio. Catalogue 70-A, describing the company's precision and commercial die sets. Sizes, dimensions, prices, and other ordering data are recommended for a full line of die sets—both the standard two-pin series and the rear two-pin rectangular series. .... 20

**CENTRIFUGAL CASTINGS**—Sandusky Foundry & Machine Co., Sandusky, Ohio. Catalogue describing centrifugal castings in more than seventy different alloys including stainless steels, plain carbon and low-alloy steels, Monels, cupro-nickels, and copper-base alloys in sizes ranging from 7 to 54-inch outside diameter. .... 21

**MANUAL MOTOR STARTERS**—General Electric Co., Schenectady, N. Y. Bulletin GEA-6358A, covering small-size "100 Line" manual starters for fractional and integral horsepower motors up to 7 1/2 hp. New features, application, and installation data, and a rating table for plug-in heaters are included. .... 22

**METAL SAWS**—Hether Brothers Saw Mfg. Co., Inc., Rochester, N. Y. Illustrated catalogue MS-500, describing saws for metalworking. Saws are segmental in both coarse and fine-pitch styles, high-speed, carbide-tipped band saws, and slitters. Catalogue also includes tool bits and tool specialties. .... 23

**CUTTING TOOLS**—Madison Industries, Inc., Muskegon, Mich. Catalogue featuring the company's adjustable boring and reaming tools, bottoming tools, trepanning tools, gun type drills, spade and core drills, adjustable bore gages, grinding arbors, and special tool engineering facilities. .... 24

**CENTER TYPE GRINDING WHEELS**—Cincinnati Milling Products Division, Cin-

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| 171   | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 |

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N-9-57

- cincinnati, Ohio. Illustrated catalogue describing the company's center type grinding wheels and containing a table of suggested grinding wheel gradings for various grinding operations. .... 25
- MONTED WHEELS**—Simonds Abrasive Co., Philadelphia, Pa. Bulletin ESA-67, describing the company's complete line of abrasive mounted wheels. All sizes and shapes in the A and B series are illustrated in actual size with dimensions indicated, and typical shapes of the W series are included. .... 26
- GAP PRESSES**—Verson Allsteel Press Co., Chicago, Ill. 16-page catalogue presenting illustrations and detailed specifications of the company's mechanical gap presses from 75- to 500-ton capacity. Design details are included as well as photographs of gap-press installations. 27
- POWER TRANSMISSION DATA**—Ohio Gear Co., Cleveland, Ohio. 186-page handbook giving power transmission data to meet modern engineering standards. Engineering charts, tables, and formulas to help select the right gears and speed reducers are included. .... 28
- COPYING MACHINE**—P&H Sales Corporation, Chicago, Ill. Bulletin 57A1, describing the company's automatic 26-inch, 75-foot-per-minute, 100-watt-per-inch blueprint machine which was research-engineered to print and develop 97.7 per cent of all cut sheet reproductions at high-volume speeds. .... 29
- BENDING MACHINE**—Struthers Wells Corporation, Machinery Division, Titusville, Pa. 4-page illustrated folder describing the company's bending machine designed to handle all types of metal from light cross-sections to heavy sections up to 2 1/2 square inches. .... 30
- ELEVATING HOPPER-FEEDER**—Gear-O-Motion Division, Michigan Tool Co., Detroit, Mich. Data sheet covering the company's hopper feeder for use with parts that roll or slide. Complete description of its construction and application are given. .... 31
- QUICK-CHANGE TOOLS**—Beaver Tool & Engineering Corporation, Royal Oak, Mich. 56-page catalogue giving detailed information on the company's complete line of quick-change tools. Correct holders for each of many different types of standard metalworking machines are shown. .... 32
- SPIRAL-BEVEL SPEED REDUCERS**—Philadelphia Gear Works, Inc., Philadelphia, Pa. 40-page catalogue describing the company's spiral-bevel speed reducers. Design features, specifying and ordering information, selection tables, service factors, and horsepower ratings are included. .... 33
- CONTOUR WHEEL DRESSERS**—Hoglund Engineering & Mfg. Co., Inc., Berkeley Heights, N. J. 6-page technical brochure outlining inclined plane cam mechanisms for dressing grinding wheels with intricate contours. .... 34
- DRILL JIG BUSHINGS**—American Drill Bushings Co., Los Angeles, Calif. 3-page
- catalogue giving bushing types and sizes, drill sizes with decimal equivalents, concentricity of bushings, and Rockwell hardness. .... 35
- ROLLERS AND FRAMES**—Alvey Ferguson Co., Cincinnati, Ohio. 4-page leaflet describing various types of rollers and frames for the company's engineered gravity and live roller conveying systems. .... 36
- ELECTRODES AND FLUXES**—Lincoln Electric Co., Cleveland, Ohio. 8-page illustrated folder SB-1354-10M, describing the company's automatic electrodes,
- submerged-arc welding fluxes and hard surfacing fluxes. .... 37
- OVERHEAD CRANES**—Industrial Crane & Hoist, Ingersoll Products Division, Borg-Warner Corporation, Chicago, Ill. 12-page illustrated bulletin describing the company's heavy double-girder overhead cranes. .... 38
- FILES**—Heller Tool Co., a subsidiary of Simonds Saw & Steel Co., Newcomerstown, Ohio. 15-page catalogue describing the company's metal and saw files, machinists' files, cabinet and wood files, rasps, and special-purpose files. .... 39

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**ELECTRIC DISC BRAKE**—Star-Kimble Industrial Motor Division, Safety Industries, Inc., Hamden, Conn. 8-page brochure describing and illustrating the company's redesigned Series E disc brake line. .... 40

**GREASE**—Dow Corning Co., Midland, Mich. 4-page brochure describing the company's silicone-base lubricant used for steel bearings in washing machines, electric razors, refrigerators, electric clocks, and other appliances. .... 41

**ELECTRIC CRANES**—Manning, Maxwell & Moore, Inc., Muskegon, Mich. 25-page bulletin describing the company's over-

head materials-handling equipment with capacities ranging from 1/8 ton to 600 tons. .... 42

**ELECTRONIC INDUCTION HEATERS**—Magnethermic Corporation, Youngstown, Ohio. Bulletin containing specifications on the company's 15-, 30-, and 40-kw electronic induction heaters. .... 43

**STANDARD HEXAGON NUTS**—National Machine Products Co., Utica, Mich. 24-page catalogue giving information on the company's line of nuts. .... 44

**SELECTOR SWITCHES**—Thermo Electric Co., Inc., Saddle Brook, N. J. Bulletin

24-1, describing the company's key or push-button selector switches for thermocouple or resistance bulb circuits. .... 45

**PRECISION SURFACE GRINDERS**—Reid Brothers Co., Inc., Beverly, Mass. 6-page brochure describing the company's line of toolroom and production grinders. .... 46

**OPERATOR-ENGINEERED GRINDERS**—Abrasive Machine Tool Co., East Providence, R. I. Catalogue describing the company's Hydrabrasive precision grinders. .... 47

**ANGLE-IRON SHEAR**—W. A. Whitney, Mfg. Co., Rockford, Ill. Leaflet describing the company's angle-iron shear that is 26 inches high and has an 18-ton capacity. .... 48

**STAINLESS-STEEL SAND CASTINGS**—Alloy Steel Casting Co., Southampton, Pa. Illustrated catalogue discussing types of stainless-steel sand castings. .... 49

**BEVEL GEAR CHUCKS**—Garrison Machine Works, Inc., Dayton, Ohio. Folder describing the latest developments and uses of automatic gear chucks. .... 50

**TRACER LATHES**—Cincinnati Lathe & Tool Co., Cincinnati, Ohio. Catalogue H-150, describing the company's Hydroguide tracer lathes. .... 51

**SAND CORE OVEN**—Allis-Chalmers Mfg. Co., Milwaukee, Wis. 12-page bulletin describing the company's Foundromatic dielectric sand core oven. .... 52

**MAGNESIUM AND TITANIUM DATA**—Brooks & Perkins, Detroit, Mich. 40-page catalogue giving detailed information on magnesium and titanium. .... 53

**SHEAR BLADES**—Simonds Worden White Co., Dayton, Ohio. Illustrated folder describing the company's standard and custom-made shear blades. .... 54

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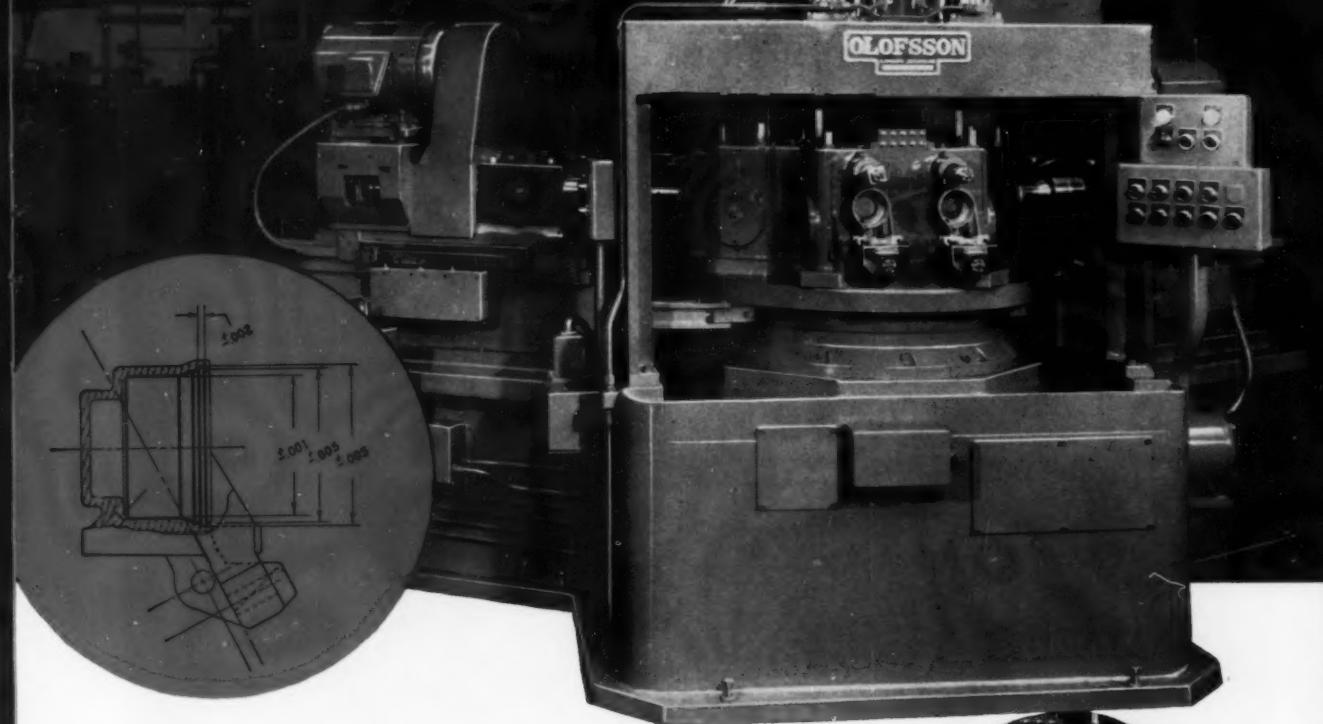
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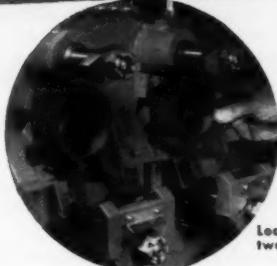
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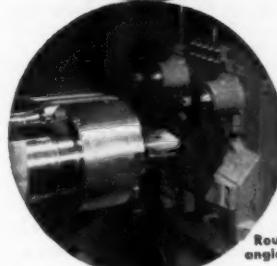


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## Canada

VICKERS, INCORPORATED, Detroit, Mich., announces the establishment of a new sales and service office at



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3365 Ridgewood Ave., in Montreal, Canada, to be known as Vickers-Sperry of Canada Ltd. ROBERT E. WALKER will be in charge.

DOMINION BRAKE SHOE CO., LTD. has acquired all the physical assets and business of Manitoba Foundries & Steel, Ltd., Manitoba, Winnipeg, Canada. Dominion Brake Shoe is a subsidiary of American Brake Shoe Co., and Manitoba Foundries has been a subsidiary of Vulcan Iron & Engineering, Ltd.

\* \* \*

### Steel Production Capacity May Double in Twenty-Five Years

The steel industries of the world may nearly double their production capacity in the next twenty-five years, according to William Butler III of the Lukens Steel Co., Coatesville, Pa. Speaking before an atomic forum held by the National Industrial Conference Board, Mr. Butler said that according to Lukens' economic studies, "with the prospects opened by nuclear power, world capacity in twenty-five years will have reached 625 million tons." Present world capacity is estimated at 327 million tons. "In this growth," Mr. Butler continued, "the United States is expected to hold its place as the world's leading producer with 40 per cent of that capacity, or 250 million tons."

## New Books and Publications

LINEAR PROGRAMMING. By Dakota Ulrich Greenwald. 90 pages; 5 1/2 by 8 inches; 25 illustrations and tables. Published by the Ronald Press Co., 15 E. 26th St., New York 10, N. Y. Price, \$3.

Requiring no mathematics beyond college algebra, this book presents an exposition in demonstration of the simplex algorithm. It is used in hand-computed solutions of linear programming problems. Emphasis is on hand solutions rather than on machine methods because most of linear programming will not have access to electronic computers. Sample problems graduated in difficulty are strategically placed throughout the text. This book will serve as a textbook for the graduate and advanced undergraduate student in industrial engineering and management and also as a handy reference source for industrial engineers.

INVESTMENT CASTING ENGINEERING AND DESIGN MANUAL. Published by the Investment Casting Institute, 27 E. Monroe St., Chicago, Ill. 70 illustrations. Price, \$5.

This manual presents information on the investment casting process and is the culmination of more than two and one-half years of combined efforts on the part of various Institute Committees. Of particular importance is the design section which presents rules governing design, dimensional tolerances, and shapes. Other subject matter covered in this section includes surface finish, functional and general tolerances, radii, straightness, flatness, concentricity, roundness, angles, length, parallel sections, blind and through-going cores, threads, airfoil, contours, and others. Both the lost pattern and frozen mercury phases of the process are given in detail.

ASTM STANDARDS ON ZINC-COATED IRON AND STEEL PRODUCTS. Heavy paper cover; 143 pages, 6 by 9 inches. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia, Pa. Price, \$2.25.

This publication is intended primarily to present in convenient reference form the various ASTM standards and tentative methods for tests and specifications pertaining to metallic-coated iron and steel products.

Standards, tentative specifications, and methods for tests represent the most up-to-date thoughts and practices. Included in the volume are twenty-one specifications, of which four are new or recently revised; three recommended practices, two of which are new; and five methods of tests. Among the materials covered are wire, strands, fencing, sheets, hardware, terne-alloy-coated sheets, and miscellaneous products.

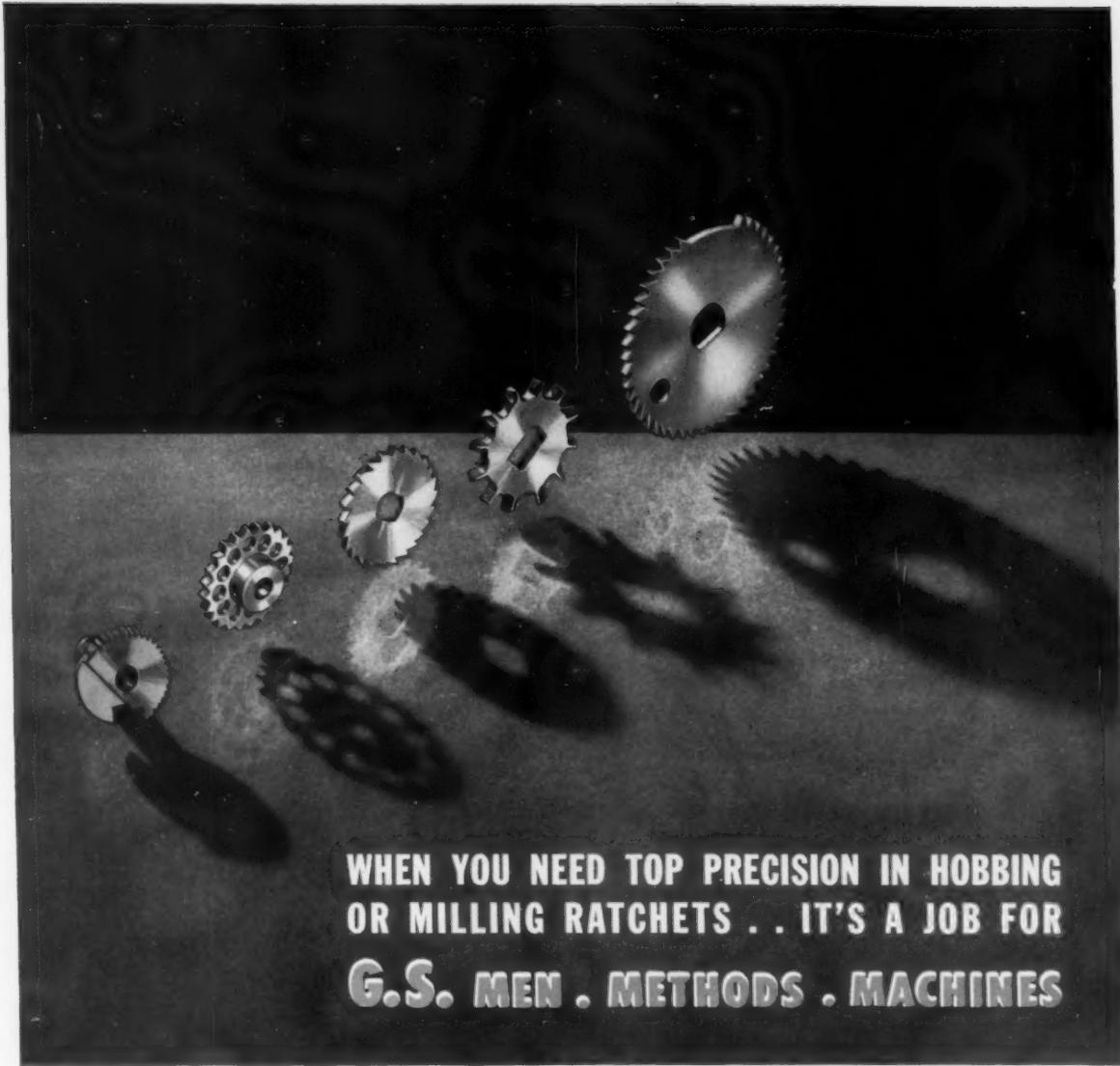
TECHNICAL DESCRIPTIVE GEOMETRY. By B. Leighton Wellman. 616 pages, 6 by 9 inches. Second Edition. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price, \$5.75.

Written in simple language, arranged in easy-to-read format, and generously illustrated, this book provides a comprehensive and modern treatment of the theory and practical applications of descriptive geometry. Every article has been re-examined, tested in class, and rewritten for maximum clarity. The complete analysis of important problems is followed by a concise summary which focuses attention on the key ideas. This edition also contains an improved presentation of visibility, perpendicular lines, views of a circle, and cylinder intersections.

1956 SUPPLEMENTS TO BOOK OF ASTM STANDARDS. Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Heavy paper covers; seven parts; \$4 per part; \$28 per set.

To keep up to date the triennially published book of ASTM standards, the Society in the intervening years, issues supplements to each part of the book.

The 1956 supplements contain 420 specifications, tests, and definitions which either were issued for the first time in 1956 or were revised since their appearance in the 1955 book. Part I. Ferrous Metals—440 pages; includes forty-eight standards. Part II. Non-Ferrous Metals—360 pages; includes sixty standards. Part III. Cement, Concrete, Ceramics, Thermal Insulation, Road Materials, Waterproofing, and Soils—300 pages; includes fifty-seven standards. Part IV. Paint, Naval Stores, Woods, Sandwich Construction, Building Constructions, Fire Tests, Wax Polishes—230 pages; includes seventy-



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eight standards. Part V. Fuels, Petroleum, Aromatic Hydrocarbons, Engine Antifreezes—320 pages; includes seventy-five standards. Part VI. Rubber, Plastics, Electrical Insulating Materials—380 pages; includes seventy-one standards. Part VII. Textiles, Soap, Water, Paper, Adhesives, Shipping Containers, Atmospheric Analysis—220 pages; includes thirty-four standards.

**METROLOGY OF GAGE-BLOCKS.** Proceedings of a symposium on gage-blocks held at the National Bureau of Standards. Circular 581. 119 pages. Published by U. S. Department of Commerce, National Bureau of Standards, Washington 25, D. C. Price, \$1.50.

This circular was published at the request of persons who had attended the symposium and also by numerous others in government and industry who are interested in the field of precision measurement. It contains fifteen papers presented at the conference as well as reports of formal and informal discussions.

### Plastic Tooling Bibliography

"Plastic Tooling Bibliography"—compiled by Orville D. Lascoe, Professor of Industrial Engineering at Purdue University as part of the plastic tooling research project being conducted at Purdue under the auspices of the ASTE Research Fund—has been made available to industry.

Copies of the 46-page, paper-bound bibliography, containing 254 references and abstracts of every major writing on plastic tooling, are available to ASTE members at a cost of 75 cents, and to non-members, for \$1.50. Orders should be addressed to ASTE Research Fund, 10700 Puritan Ave., Detroit 38, Mich.

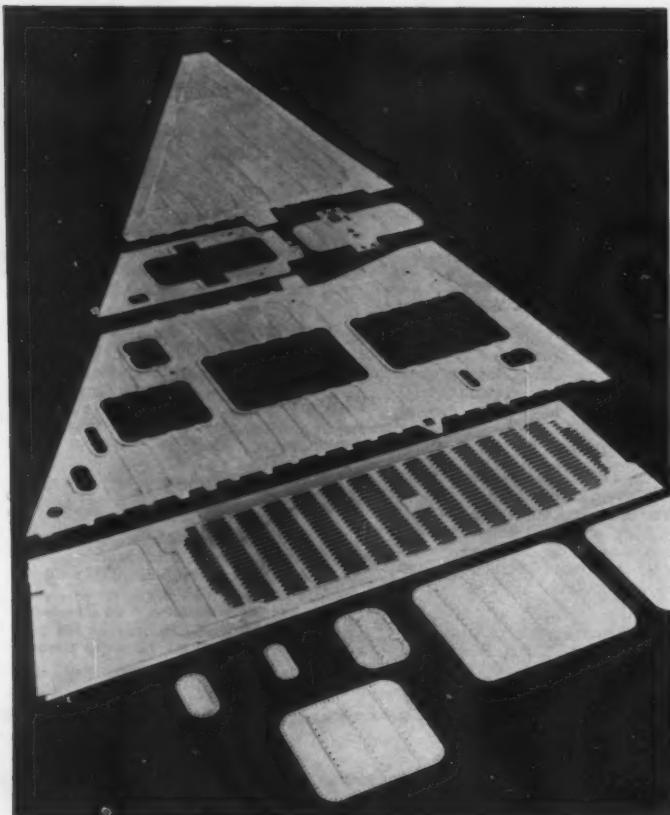
### Simplified Recommendation for Grinding Wheels

The revised edition of "Grinding Wheel Simplified Practice Recommendation R45-57" has been approved by the United States Department of Commerce. This seventy-six-

page book supersedes the 1947 edition and includes many major changes.

The book is arranged in two parts: Part I lists standard shapes and sizes of grinding wheels classified according to use; Part II contains a complete listing of all standard sizes of grinding wheels available in each standard shape. Former editions have listed grinding-wheel size recommendations for new machine design in bold type. The 1957 edition has segregated all shapes and sizes in the use classification section. Now machine designers need only check this listing for the operation the machine is to perform in order to locate the standard grinding-wheel shapes and sizes available.

Six new basic grinding-wheel shapes have been added, and a word description is given for each of the standard wheel shapes to clarify accompanying line drawings. Single copies of the new edition are available free of charge by request on company letterhead from the Grinding Wheel Institute, 2130 Keith Bldg., Cleveland 15, Ohio.



Using specially designed machines, Tapered Air Products Corporation, Lynwood, Calif., has produced these components for a Convair delta-wing interceptor. The skins and structural components have been sculptured from 5/16-inch thick 2024-T aluminum down to sections that are, in some places, as thin as 0.055 inch. Metal removal runs as high as 75 to 85 per cent.



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# Magnamatics



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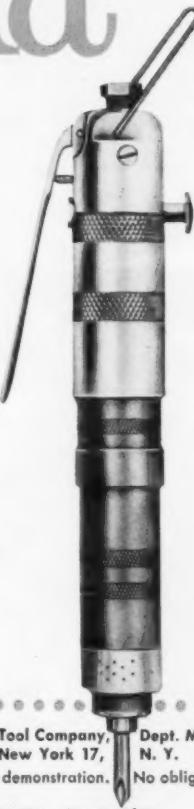
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## **Privately-Owned Betatron Installed for High-Voltage Radiography**

The Bonney-Floyd Co., Columbus, Ohio, has installed the first privately-owned industrial 24-million-volt betatron in the United States, other than that at the plant of the manufacturer, Allis-Chalmers, in West Allis, Wis. It is a track-mounted unit and shuttles back and forth between two radiography rooms for maximum utilization. Apertures in the end walls of the two rooms and precision positioning of the unit at either end of the track make it possible to set up castings for X-raying in one laboratory while other castings are being radiographed in the adjacent one.

## **Solid Carbide Tool Institute Formed**

Engineers representing solid carbide tool manufacturers met recently in Detroit to form the Solid Carbide Tool Institute. Objectives of the Institute include the establishment of uniform physical standards for solid carbide cutting tools and the standardization of their nomenclature and marking. Officers of the Institute are: John A. Wright, Rotary Tool Industries, Detroit, Mich., president; Clin-

ton Smith, Pratt & Whitney Co., Inc., West Hartford, Conn., vice-president; and Richard Englander, Essex Rotary File & Tool Corporation, New York City, secretary-treasurer.

Meetings will be held periodically to consider a standardization program that will include raw materials used to make the tools. Work has already begun on the establishment of criteria for carbide burr dimensions, shapes, and tool numbers. Standards on other tools such as drills, reamers, and end-mills are to follow. Inquiries regarding membership or other matters may be directed to the Solid Carbide Tool Institute, 295 Madison Ave., New York 7, N.Y.

## **Tiny Battery Will Last Five Years**

An atomic-powered battery no bigger than a cough drop and capable of delivering usable electricity for at least five years has been announced by Elgin National Watch Co. and Walter Kidde Nuclear Laboratories, Inc. Beta rays from a radioisotope are converted to light, and light to electricity (about 20 micro-watts). This is accomplished through physical reaction with tiny silicon photocells and use of phosphor materials. Batteries are used for transis-

torized radios, hearing aids, and even electric wrist watches. It is predicted that the cell will be commercially available in three years.

## **Gold-Plated Windshields**

The sun's heat may be kept out of future cars by gold-plated windshields. A microscopically thin film of gold reflects infra-red rays, yet permits shorter (and cooler) wave lengths to pass through. Ford Motor Co. engineers are experimenting with a new method which consists of putting windshield and gold foil in a vacuum chamber. As the foil melts, gold molecules are deposited on the glass. A light meter measures the film and stops the process when the right thickness is reached.

## **Plating of Refractory and Light Metals**

Electrodeposits of several of the refractory and light metals or their alloys have been made from organic solutions at the National Bureau of Standards. Metals deposited include beryllium and alloys of magnesium, titanium, or zirconium with aluminum. Except for aluminum, plating of the refractory and light metals is not yet commercially practicable.



Center punches with brazed tips of Grade KL Kennametal tungsten carbide. A large solid punch (left) and a small self-operating, or impact type (right) have been provided with inserts measuring  $\frac{1}{8}$  inch and  $\frac{1}{16}$  inch in diameter respectively. The tip of the large punch was ground to a cone shape having an included angle of 90 degrees—the cone of the small tip having an included angle of 60 degrees. Both points were diamond-honed to a spherical radius of 0.005 to 0.008 inch. After being used for six months on a variety of materials the shank of the large punch was reduced in length to 2 inches, due to metal peening and regrounding, but the carbide tip remained in satisfactory condition.

# GET THE ADVANTAGE OF VERTICAL DESIGN

in an automatic precision boring machine

- ★ Easier to tool and operate.
- ★ Makes possible more extensive use of two or more spindles.
- ★ Provides adaptability of automatic indexing tables (*allows loading and unloading of work-pieces while the machine is automatically cycling*).



## Typical Application

A completely tooled "PRODUCTION PACKAGE" by Wadell for boring Electric Motor End Shields.

BORE DIA. — .5006/.5003  
CONCENTRICITY TO O.D. — .001 TIR  
LENGTH OF BORE — 1"  
PRODUCTION — 720 pcs/hr @ 100%

Send us your part prints and we will quote complete "PRODUCTION PACKAGE" cost.



Write for new catalog

# WADELL

EQUIPMENT COMPANY

TERMINAL AVENUE • CLARK, NEW JERSEY



SCHIESS

Schiess KZ 250 Double  
Column Vertical Boring Mill  
machining a 6-station index turntable,  
24" high, 96" diameter, used by automotive  
manufacturer for an automatic machine.

**"Our Schiess vertical boring mill  
DOES THE JOB 3 TIMES FASTER,  
MORE ACCURATELY, with a BETTER FINISH!"**

Hahn Manufacturing Company, 5332 Hamilton Ave., Cleveland

Jobs of increased size and time limitations no longer hold back production at Hahn Manufacturing Company.

The company reports: "Our Schiess machine has already handled a 60" high cast iron cylinder and a 108" diameter ship propeller. We cut production time by using the two boring heads together. For instance, one head can be used for roughing while the other is finishing. Or one head can be used for turning while the other is boring."

"Our operators claim the machine is just about foolproof. They like the cross-rail electro mechanical controls. They also praise the hydraulic pre-selection of speeds, the finger-tip control for direction of feed and rapid traverse, and the all-vertical gear drive. Another thing—no special training

was needed. Our regular machinists put it right to work as soon as they learned the controls.

"The Schiess mill does our big jobs just about three times faster, provides a better finish, is more accurate and results in less spoilage."

Get to know this product of Europe's largest builder of heavy machine tools. Parts and service are as close as Pittsburgh. An American Schiess engineer will be happy to help you size up this heavy producer for your heavy production needs.

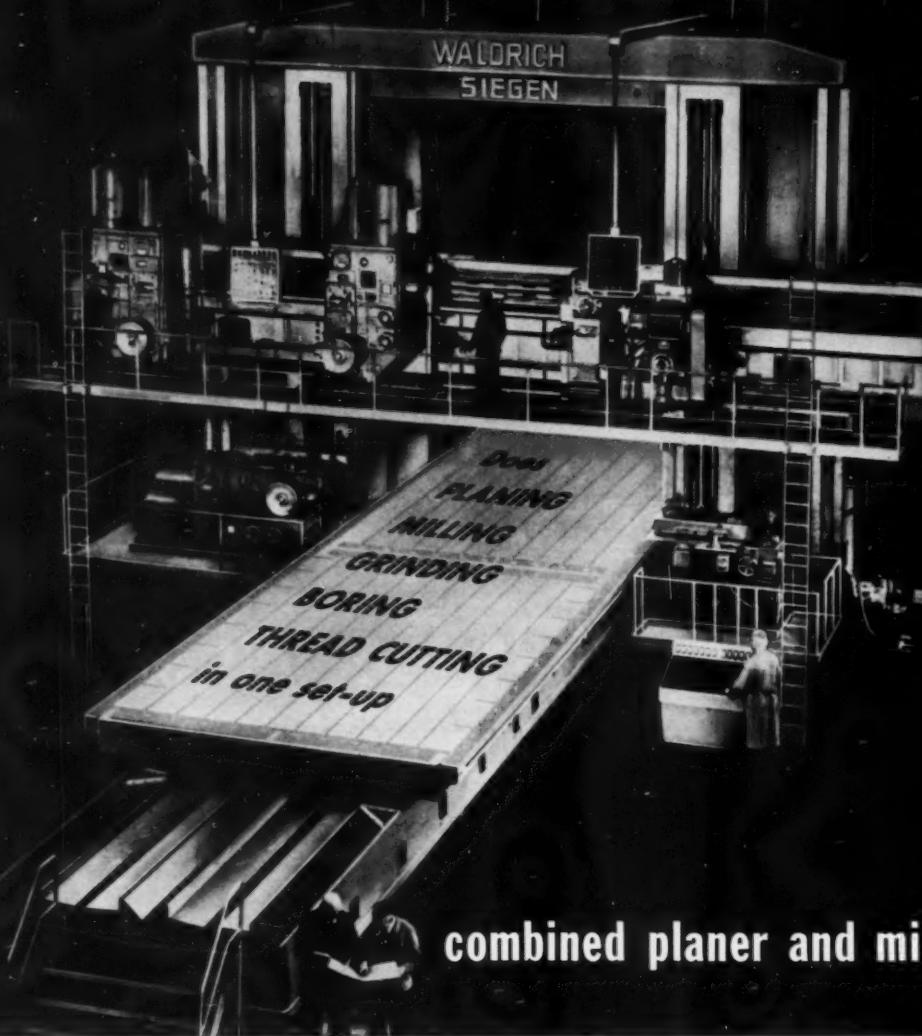
Write for catalog and complete specifications.

*Standard Model KZ Double Column Vertical boring mills are available with 80", 98" and 118" turning diameters.*

**SCHIESS**

AMERICAN SCHIESS CORPORATION • 1232 Penn Avenue, Pittsburgh 22, Pa.

# this 480 ton giant has 5 heads



## combined planer and milling machine

No need to risk the inaccuracies that come from moving a workpiece weighing up to 100 tons from machine to machine for different operations. One set-up is all you need with this Waldrich Siegen machine. And just think of the tremendous savings in set-up time and costs.

Three milling heads take care of milling, boring and thread cutting operations; another head does planing and grinding; and there's a planer side head, too.

The Waldrich patented tool retracting mechanism in the planer head raises tool in a straight vertical plane after unclamping, repositions tool automatically, then reclamps. Cross rail is clamped hydraulically in exact horizontal position, located by separate electric drive. Built-in optics confirm accurate location.

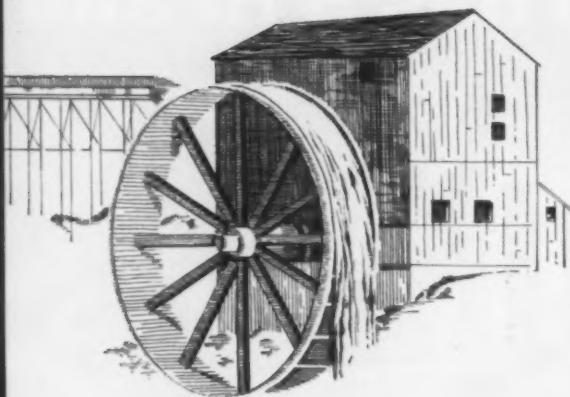
Rigid, you bet—from top to bottom! Waldrich construction features a base plate crossing under machine and tying columns and bed into one ruggedly rigid unit. And there's a total of 900 h.p. working for you.

Write for all the specs on this mammoth producer. And ask a Waldrich engineer to discuss them in detail—in terms of your production needs.



## american waldrich mfg. corp.

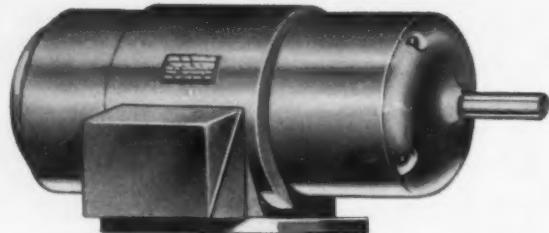
1232 PENN AVENUE, PITTSBURGH 22, PENNSYLVANIA



*Great in its day...*

BUT

WOULDN'T YOU



RATHER HAVE THE LATEST TECHNICAL ADVANCE?

## Now . . . from Heller

*Another great technical advance in tools . . .*

## "Job Tempered" Metal Cutting Band Saws

Certified by American Standards Testing Bureau\* to meet their standards for superior cutting — Uniform Teeth . . . Uniform Set . . . Uniform Temper

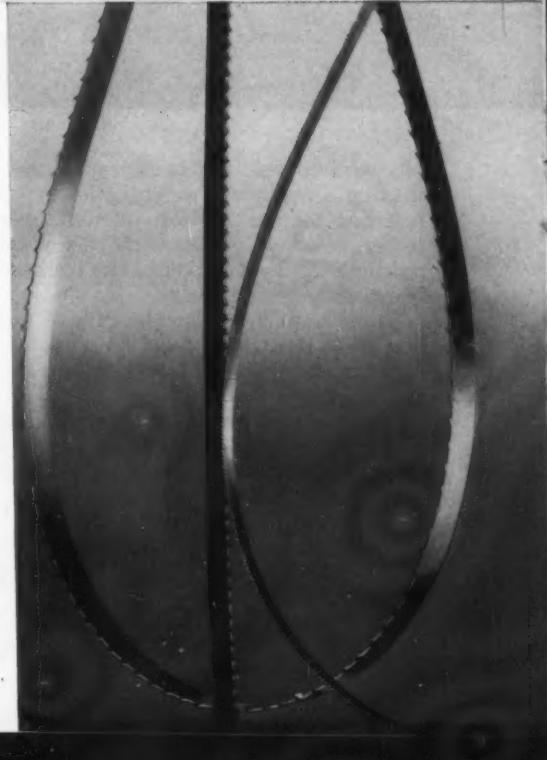


There's a new way to achieve smoother, faster cutting on band saw machines, with longer life on a variety of metals. Heller's "JOB TEMPERED" Metal Cutting Band Saws.

Heller's exclusive metallurgical and heat treating processes that have won these blades the name "JOB TEMPERED" have also earned them American Standards Testing Bureau's Certification. This is your assurance that these blades meet the three prescribed standards for superior cutting . . . uniform teeth . . . uniform set . . . uniform temper. As a result, when you use the right Heller Blade for the job, you're sure of superior cutting every time.

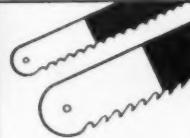
Heller "JOB TEMPERED" Hard Edge Band Saw Blades are available in all tooth shapes . . . Standard Tooth (Regular or Wavy Set), Skip Tooth and Hook Tooth. Saws are available in all standard widths and tooth spacings . . . in 100' and 250' coils or welded to specified lengths for use on all type machines.

High Speed Steel Band Saws are also furnished for specific applications.

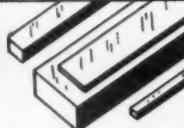




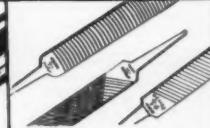
**Heller**  
**nucut**



HACK SAW BLADES



FLAT GROUNDED DIE STEEL



FAMOUS HELLER FILES

**HELLER TOOL CO.** Newcomerstown, Ohio

America's oldest file manufacturer

A subsidiary of Simonds Saw and Steel Co.

*Give us your toughest  
band sawing problems*

If you've been having trouble, let us show you how the right JOB TEMPERED metal cutting band saw can give you better cutting, longer service and greater economy.

*Here are the facts!*

Heller's new catalog of JOB TEMPERED metal cutting band saws contains full description of types of blades, tooth designs and set. WRITE FOR YOUR COPY TODAY.



SOLD EXCLUSIVELY THROUGH



# Why should you pay for top quality in "Commercial Grade" Roller Bearings . . . AND NOT GET IT?

**I**t's wasteful to pay for quality you don't need. It's negligent to pay for quality you don't get.

From the simplest steel-cage type to the finest segmented-retainer type, Rollway "commercial grade" Tru-Rol Roller Bearings incorporate as closely as possible design and construc-

tion principles found normally in a Rollway maximum-type precision bearing.

Take the segmented-type Tru-Rol for example. Each deep-section separator segment is formed to fit the curvature of the roller. Each roller has a separator segment to keep it in accurate

alignment. And each roller is crowned to distribute load evenly along the full length of the roller.

That's a lot different from small-diameter, unground spacers staggered at unequal intervals, resulting in rollers rubbing in opposed-motion, and non-uniform roller distribution that can set up out-of-balance vibration and "pulse."

Let a near-by Rollway Service Engineer consult with you on your bearing problems. No charge. No obligation. Just write us. Rollway Bearing Co., Inc., Syracuse, N. Y., manufacturers of a complete line of radial and thrust cylindrical roller bearings.



Cutaway view of Rollway Tru-Rol® segmented-retainer roller bearing.  
one of three distinct types of Tru-Rol bearings available.

ENGINEERING OFFICES: SYRACUSE • BOSTON • CHICAGO • DETROIT • TORONTO • PITTSBURGH • CLEVELAND • MILWAUKEE • SEATTLE • HOUSTON • PHILADELPHIA • LOS ANGELES • SAN FRANCISCO

## Check This List AND BE SURE!

### Retainer Operation

- Is the retainer roller-supported, to reduce sliding friction?

### Retainer Construction

- Is the retainer strong enough to withstand shock loads and sudden reversals?

(A Rollway segmented-type steel retainer, such as that illustrated, is the strongest, most durable available in commercial grade bearings.)

### Roller Spacing

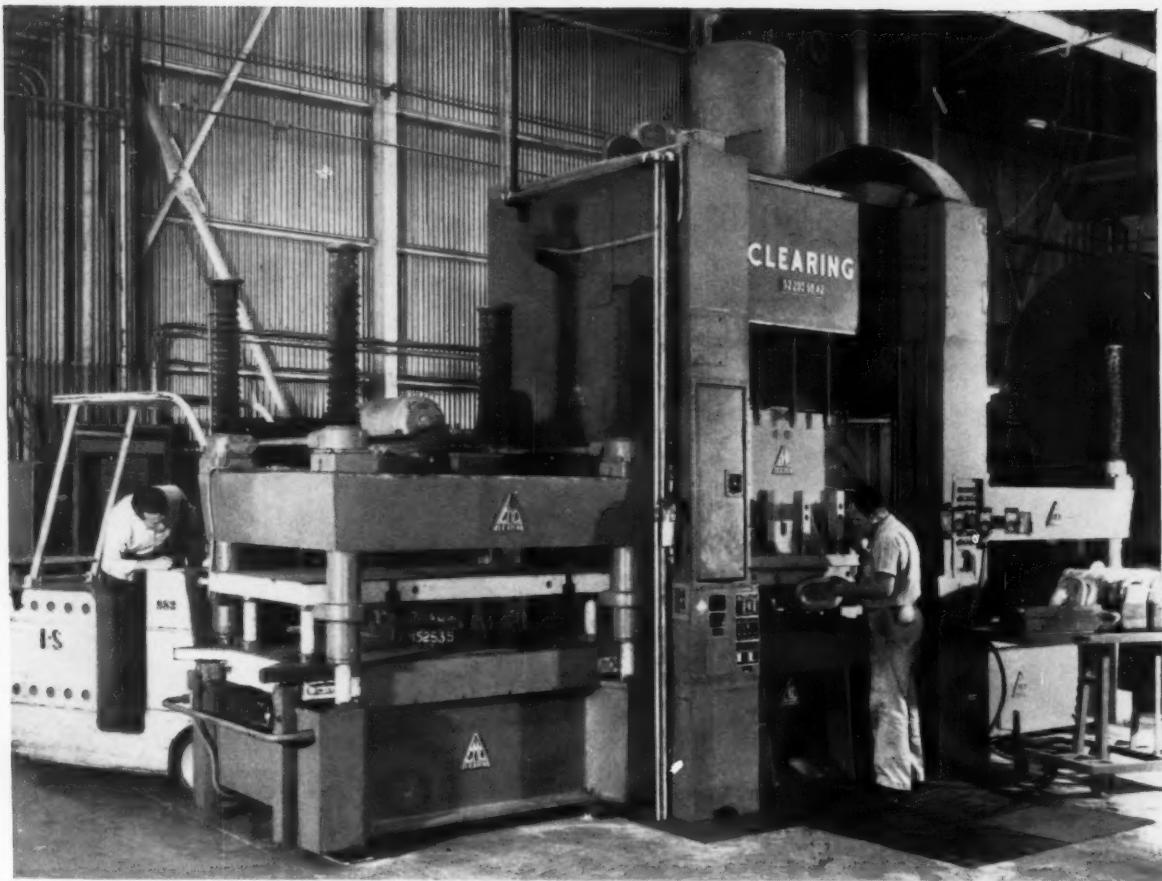
- Are all rollers equally separated, or do some rub against each other in opposed-motion friction?
- Are rollers distributed evenly to prevent "pulse" and vibration?

### Roller Construction

- Are the rollers crowned for optimum load distribution?

For Top Quality in Every Detail Buy Tru-Rol and Be Sure!





## **How North American Aviation plans continuous production of short runs with a **CLEARING MOVING BOLSTER** Press**

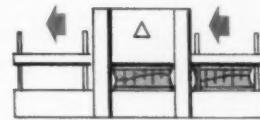
As you know, the aircraft industry needs a lot of short run stampings, and short runs can plague a production man because a lot of valuable time is eaten up in die setting. But here's the way Clearing has helped North American Aviation, Inc. lick that problem. The press above has a double bolster that can be automatically powered across the die area.

While one job is running, the next job is being set up *outside* the press. When you finish this production run, push a button and the dies are unclamped from the press slide. Another push button rolls the new dies into place under the slide. Clamp these in and start running. Now you can set the next job up on the other side of the press.

The device at right is another added feature. It's a die separator that makes it possible to open the dies for maintenance and inspection without tying up crane facilities.

Clearing moving bolster presses can be the answer for your company if you want to put more productive hours in a day. We have a folder prepared on "Push Button Die Setting." It's yours for the asking.

### **how it works**



Dies are set up outside the press. When the current job is completed the bolster is traversed automatically to the right or left. Now the dies are in place for the next job. Slide clamps which hold the die to the slide are also engaged and disengaged automatically.

## **CLEARING PRESSES**

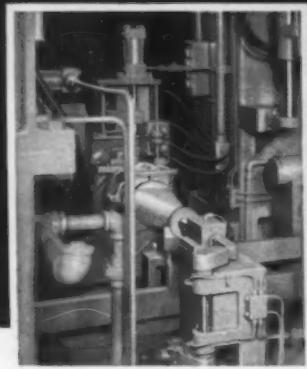
THE WAY TO EFFICIENT MASS PRODUCTION

**CLEARING MACHINE CORPORATION** division of **U. S. INDUSTRIES, INC.** 

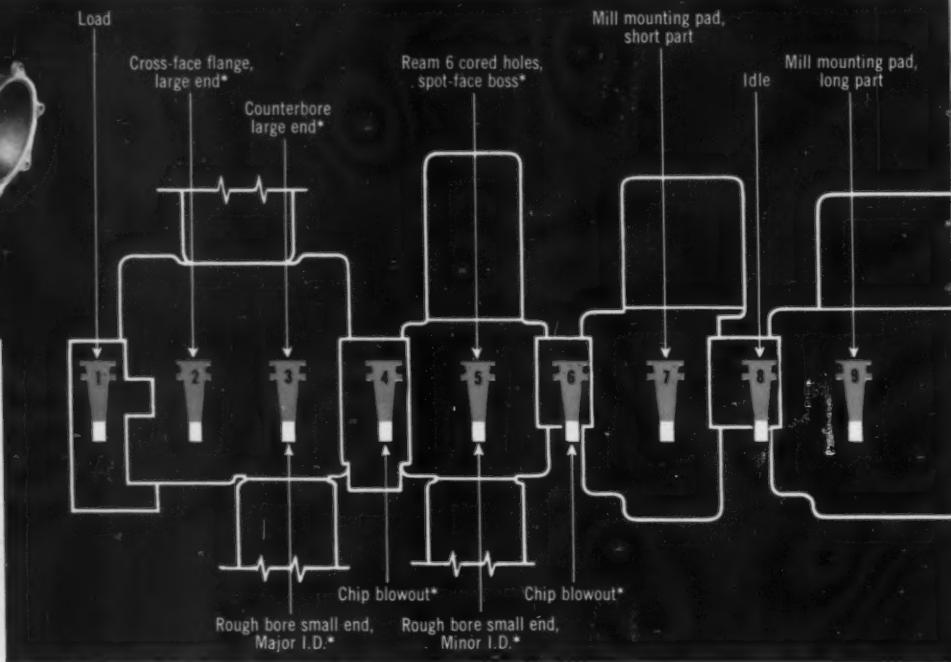
6499 W. 65th STREET, CHICAGO 38, ILLINOIS • HAMILTON DIVISION, HAMILTON, OHIO



# PRODUCING



**Rotating station.** Plate moves in, locates on part and trips limit switch, causing rotation for next operation.



## MACHINING TIME—20 SECONDS CHANGEOVER TIME—ONE SECOND

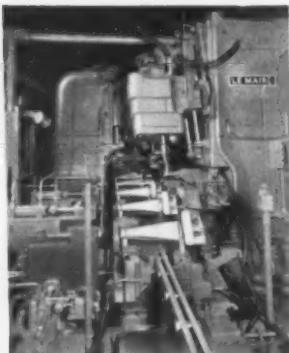
This LeMaire 21-station transfer machine, installed by one of the automotive "Big Three," completely machines 180 aluminum transmission extensions per hour. It handles two different length parts . . . and is changed over from one part length to the other with the one-second flip of a switch.

Most of the stations process both part lengths; others handle either the long or the short part exclusively. On the latter, parts which the station is not designed to process are passed automatically to the next operating station. Sensing devices, actuated by one selector switch on the main control panel, accomplish the changeover to machine different part lengths without manual adjustment of dog rails or limit switches, and without changing tool spacing, feeds or speeds.

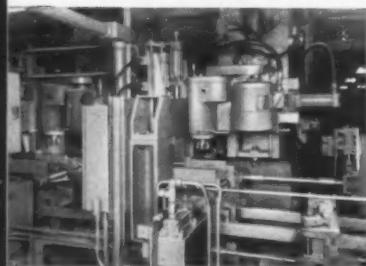
Other features:

- Walking beam transfer with hardened pickup members and precision hydraulic control
- Unitized construction
- Complete electrical interlock
- Individual controls at each station
- "PresTest" lights on main panel
- LeMaire patented test panel in all control cabinets
- Automatic lubrication
- Electrical and hydraulic systems to J.I.C.

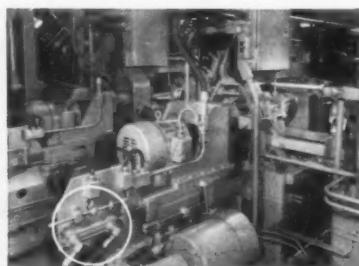
This is just one of many successful, *producing* installations designed, manufactured and tooled by LeMaire. Let us help with your production machining problems.



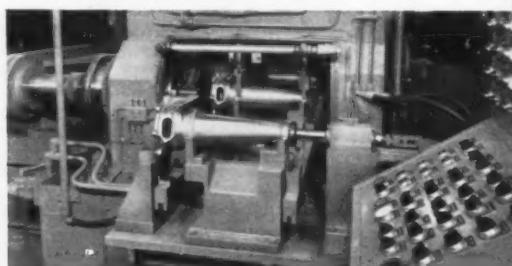
**Hardened pickup members hold part during transfer, locate it approximately prior to nesting in precision locators.**



**Station 7 (left) mills mounting pad on short part. For long parts, this station is automatically skipped for Station 9 (right).**

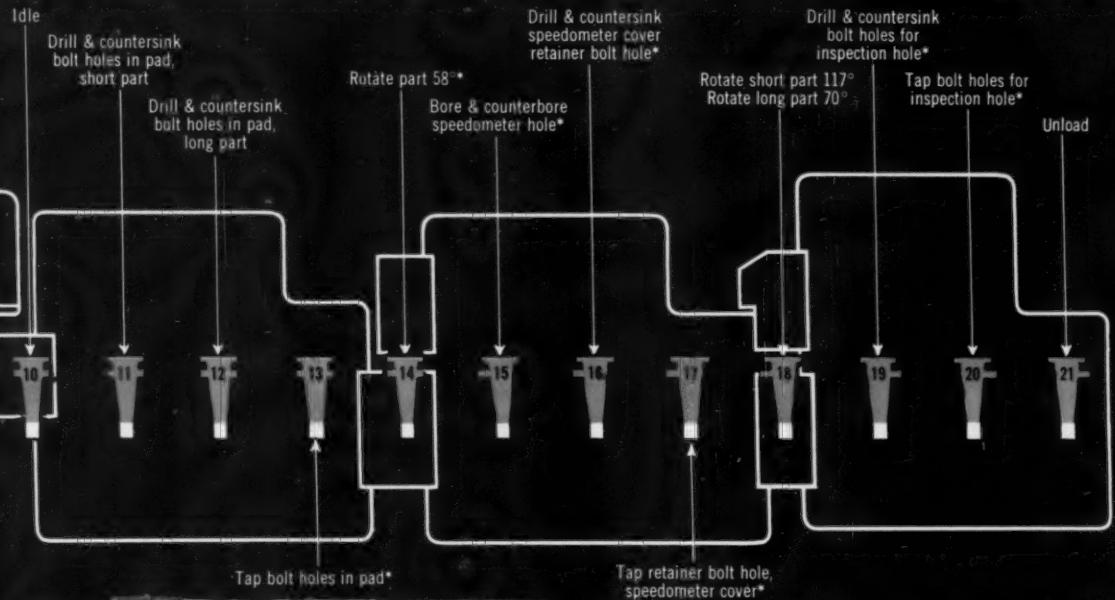


**Note hydraulic cylinder which re-positions dog rail on hydraulic slide unit for part length change. Actuated by selector switch on main panel.**

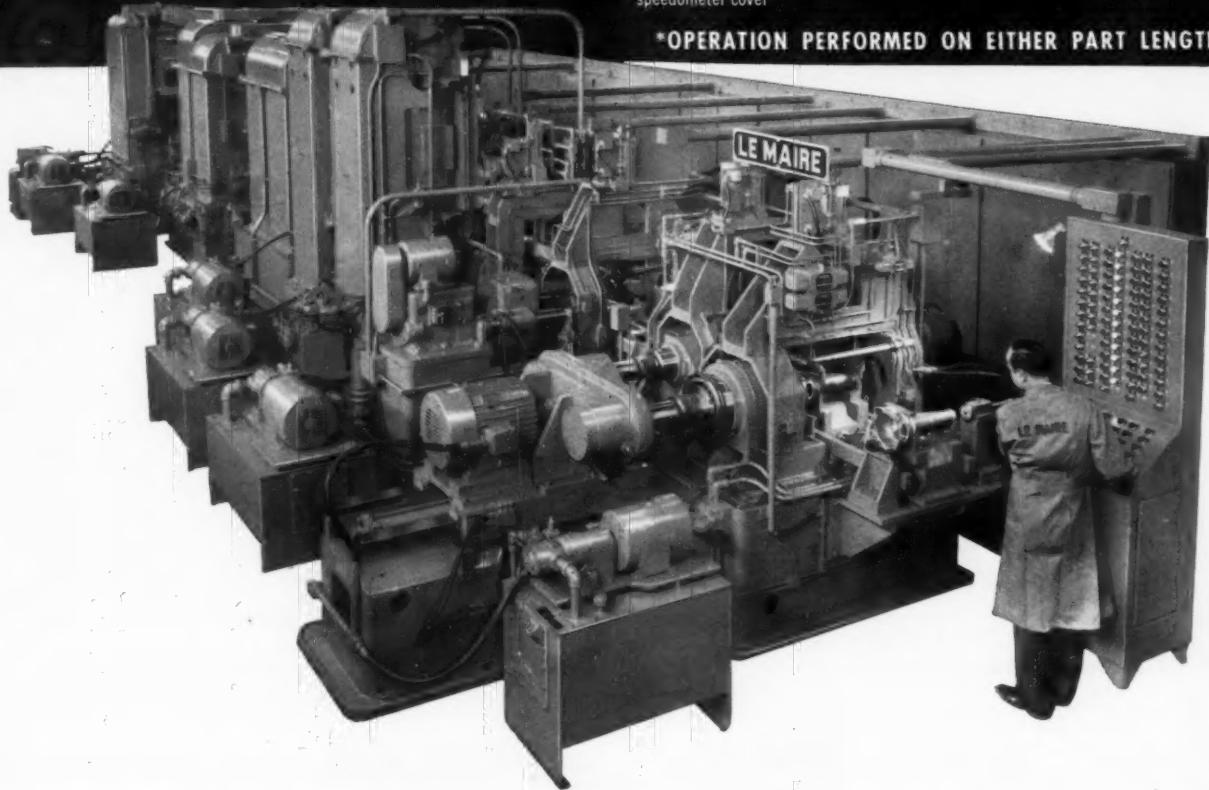


**Load station. Placing part in half locators depresses limit switch, causing interlock. Pressing cycle-start button causes walking beam pickup and transfer to No. 2.**

# with LE MAIRE



\*OPERATION PERFORMED ON EITHER PART LENGTH



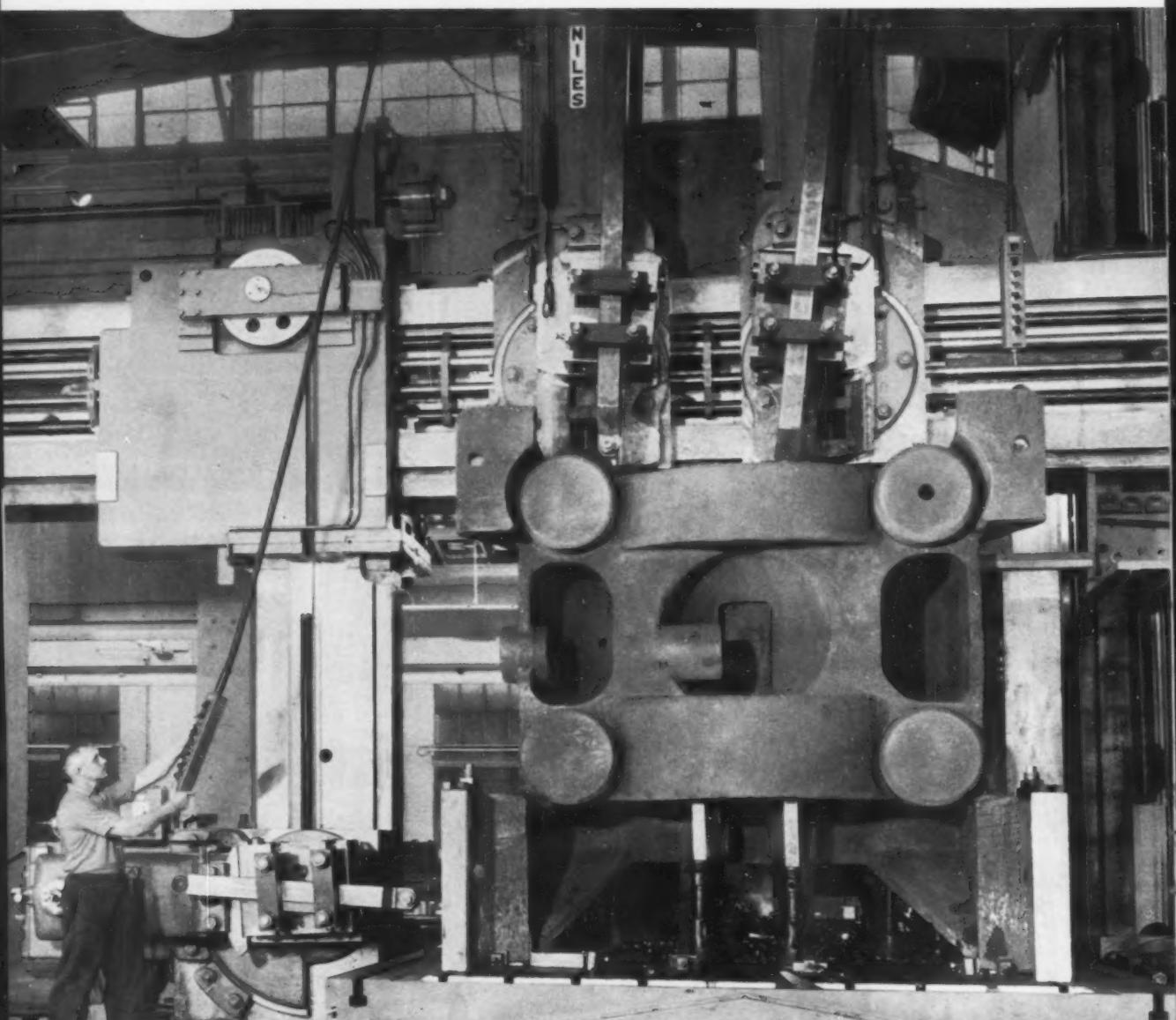
# LE MAIRE

TOOL AND  
MANUFACTURING  
COMPANY

2657 SOUTH TELEGRAPH ROAD • DEARBORN, MICHIGAN

Designers and Builders of Special High-Production Machines

# Allis-Chalmers DC MOTOR and Drive Giant



**Combining** the rigidity of a double housing planer with the versatility of a convertible planer, this Baldwin-Lima-Hamilton machine is shown operating on a 2000-ton National high-speed forging Maxipres bedframe.

**ALLIS-**

# CONTROL...

# New Planer

**Baldwin-Lima-Hamilton NILES**

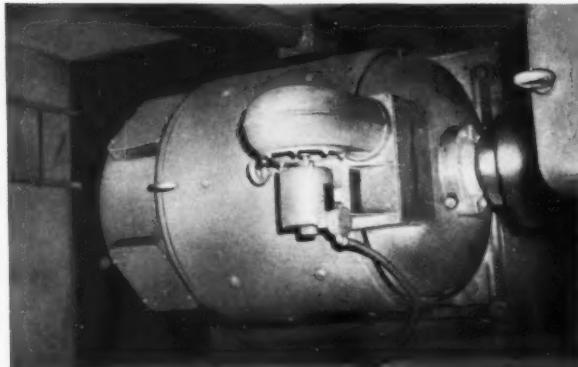
## Planer Handles Flatcar-Size Castings in One Setup at National Machinery

Reduced machining time . . . single setup . . . one-man control — all are advantages of this huge planer which handles any casting within the size dimensions of a railroad flatcar shipment.

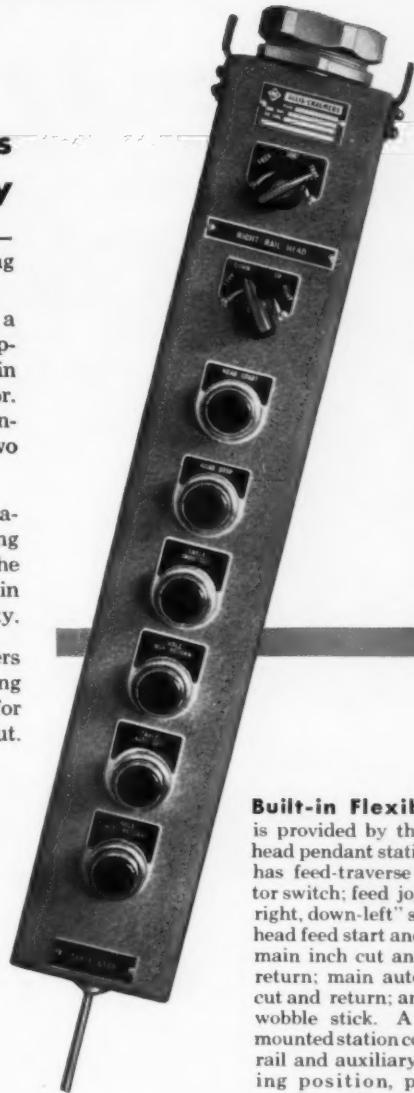
Giving the giant machine maximum flexibility and speed is a specially engineered combination of Allis-Chalmers motors, supporting motor-generator set, *Regulex* exciter, and control. Main power is supplied by a 100-hp, variable-voltage reversing motor. This motor and the auxiliary ac motors are coordinated by controls which can be operated from several locations, including two pendant stations.

**Single-Handed Positioning** — The pendant control stations and other stations permit the operator to position for planing and make all adjustments without help. From one location he may adjust both the left-hand auxiliary housing and planing, in addition to other functions. This gives the machine great flexibility.

**On-the-Job Insurance** — Every part of the Allis-Chalmers drive motors, from long-lasting field coils to thorough ventilating system, is built to eliminate costly shutdowns. It's designed for heavy duty . . . handles extra-tough cuts with no chance of burnout.



**Sturdy Construction** is a prime feature of this Allis-Chalmers 100-hp, dc drive motor. Located in a deep pit below the planer, its rigid design holds bearing alignment true — keeps grease in, foreign particles out.



**Built-in Flexibility** is provided by this rail head pendant station. It has feed-traverse selector switch; feed jog; "up-right, down-left" switch; head feed start and stop; main inch cut and inch return; main automatic cut and return; and stop wobble stick. A floor-mounted station controls rail and auxiliary housing position, planer speeds, and tool lifting.

**There's a right combination** of Allis-Chalmers motors and control for your application, too. Contact your nearby Allis-Chalmers sales office or write Allis-Chalmers, General Products Division, Milwaukee 1, Wis.

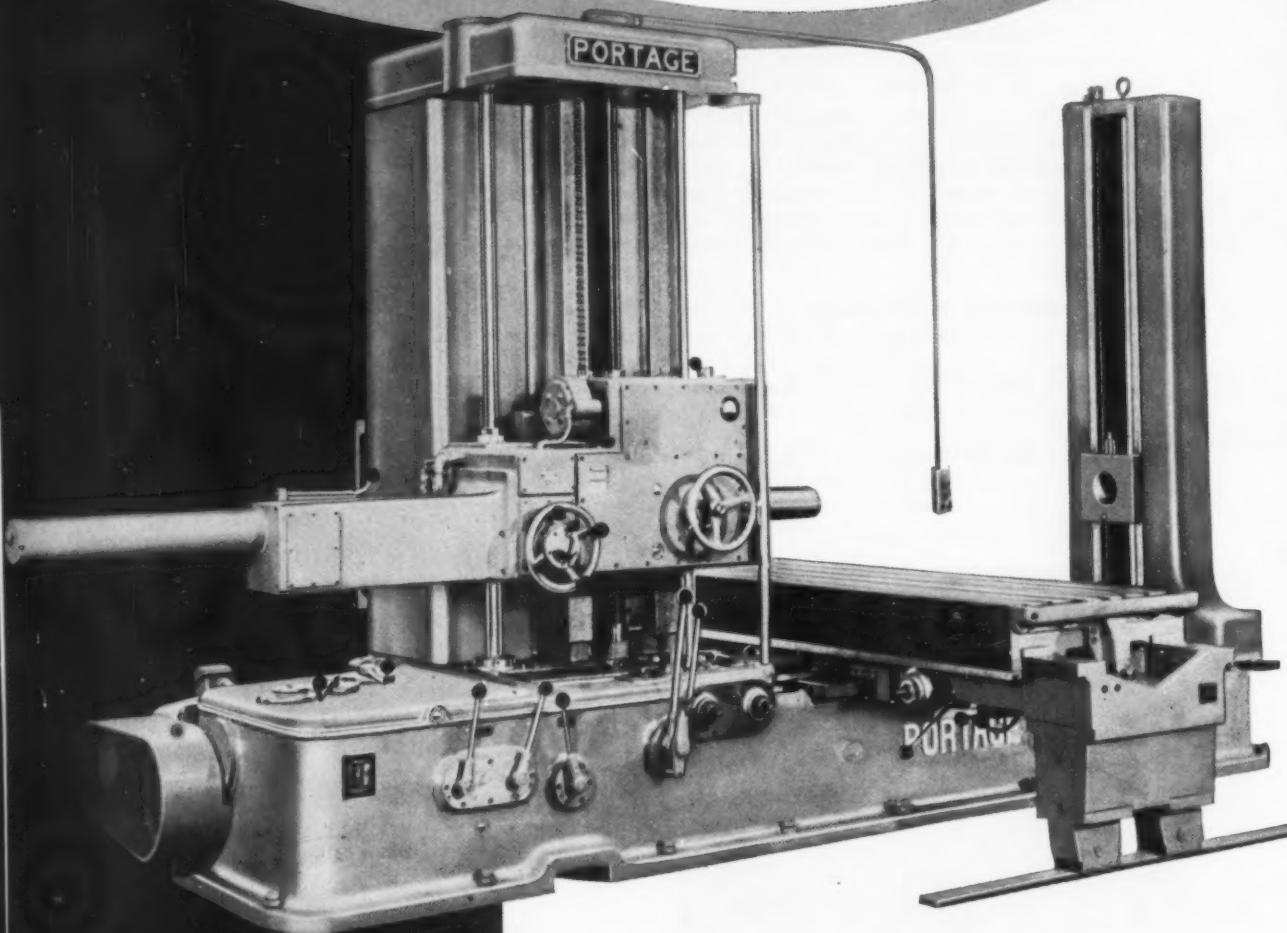
# CHALMERS



# PORTAGE

Announces...the

## NEW LOOK



The new PORTAGE No. 4 Horizontal Boring, Drilling and Milling Machine has a complete NEW LOOK. A heavier base, column, saddle and head are a few of the new features. The overall "beefed up" machine offers a wider range of versatility. NOW... you can handle the larger work... with the smallest possible capital investment. Write for complete information.



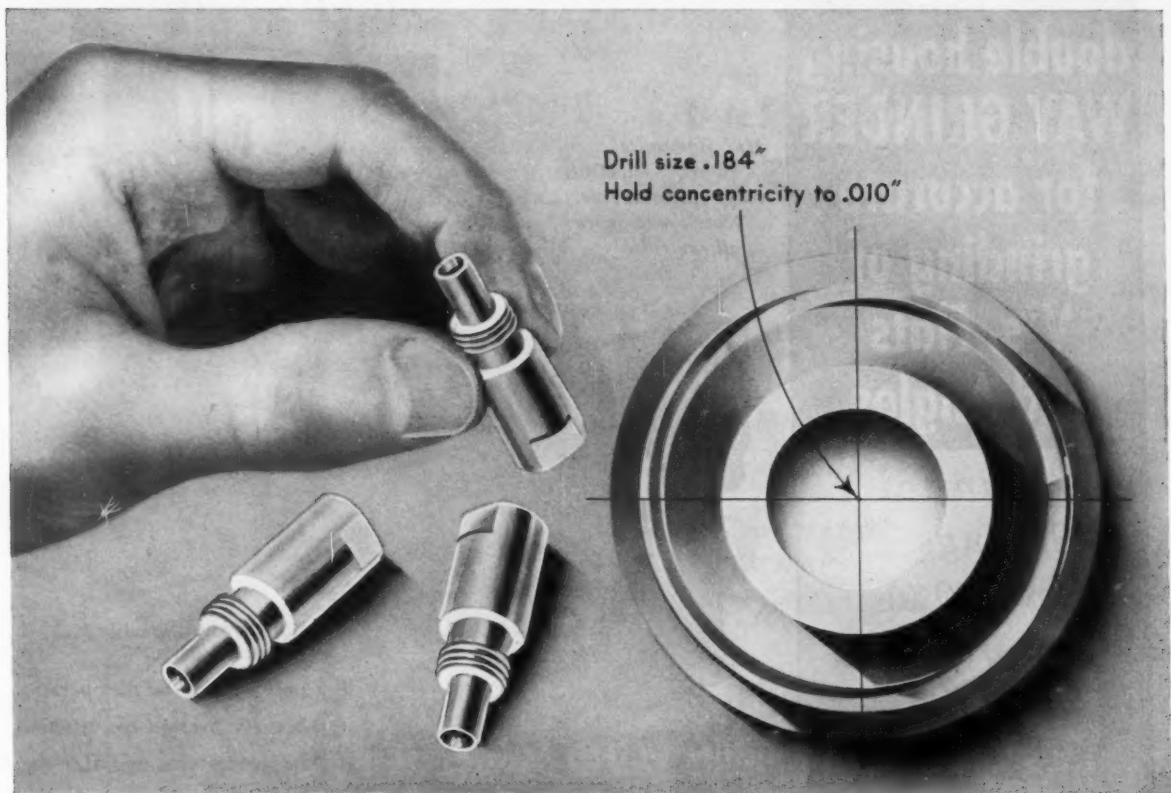
THE Portage MACHINE CO.

1036 Sweitzer Avenue • Akron 11, Ohio

Representatives in Principal Cities

BUILDERS OF PRECISION MACHINE TOOLS, SPECIAL AND PRODUCTION MACHINERY SINCE 1916

# How Anaconda can help you get the exact Rod to fit the job



THE broad line of Anaconda free-cutting copper and copper-alloy rods gives you widest latitude in selecting from warehouse stock the precise rod for most screw machine jobs. But every once in a while there are special requirements.

**One company's problem:** The M. J. Grass Screw Machine Products Co., Buffalo, N. Y., machines a part for a gas-burner base from  $\frac{1}{2}$ " round free-cutting brass rod. Specifications call for a hole  $1\frac{1}{16}$ " deep by .184" in diameter—with concentricity held to .010".

With standard free-cutting brass rod the drill had a tendency to wander, running the concentricity off as much as .024". To correct this, The American Brass Company provided rod stock with a minor variation in fabrication for deep drilling. This free-cutting brass rod has a slightly harder core, which minimizes the tendency of the drill to run off center at the high drilling speeds used. Now M. J. Grass holds the concentricity to .008" or under. With regular free-cutting brass, rejects ran as high as 15%. With the deep-drilling rod, there are no rejects.

**Your requirements:** Anaconda Rods are consistently uniform in composition, temper, and free-cutting characteristics. Consequently, they make possible easy duplication of cutting speeds and feeds known to be satisfactory from previous job records.

When you need special physical characteristics, such as a harder core for deep drilling or additional ductility to permit spinning or cold forming after machining, either the temper, the alloy, or both can be adjusted to meet your requirements.

**Free technical service:** It is the function of the Technical Department of The American Brass Company to assist metal users in the solution of special problems. This service is at your disposal without charge.

Comprehensive data on composition and machinability of standard Anaconda Alloys, standard specifications, weights, and dimensions of standard rods is available in Publication B-3. For this booklet — write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 5770

**ANACONDA<sup>®</sup> RODS FOR SCREW MACHINE PRODUCTS**  
MADE BY THE AMERICAN BRASS COMPANY

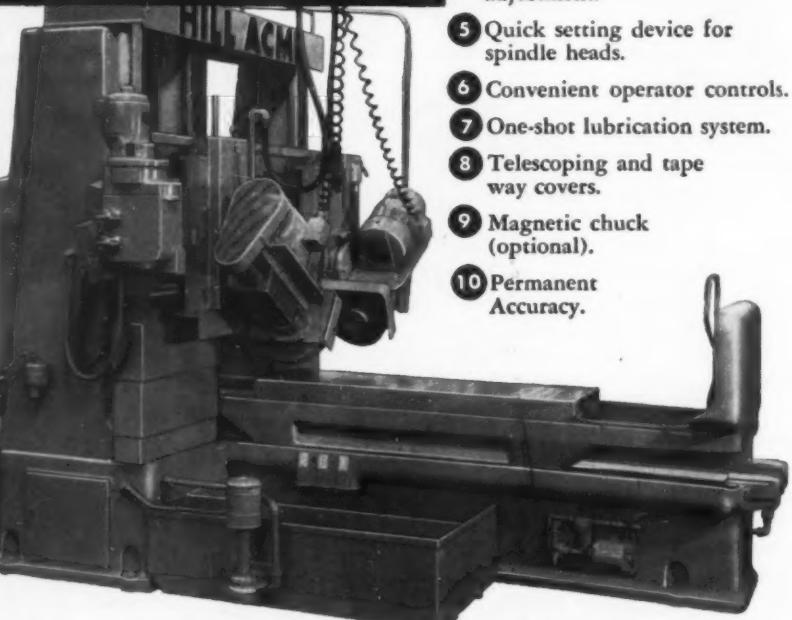
# HILL double housing WAY GRINDER for accurate grinding of V's, Flats and Angles

*Substantial  
Savings  
(up to 50%)  
over previous  
methods.*

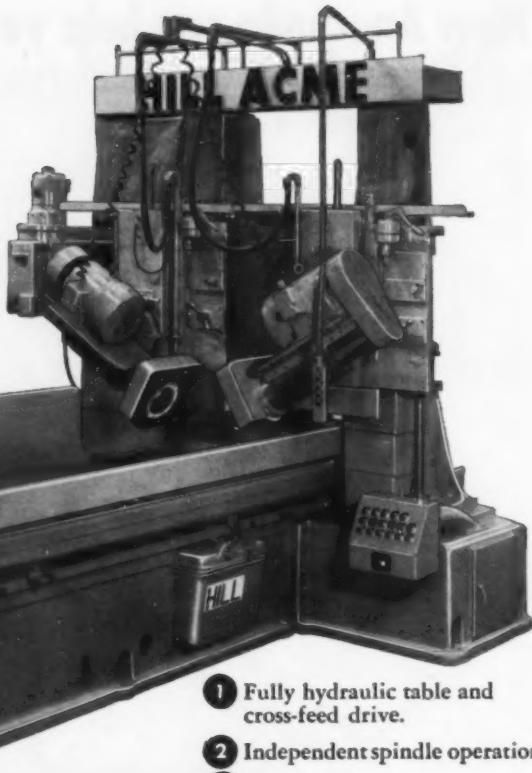
10

## points worth considering

Rear view of  
**HILL double housing  
WAY GRINDER.**  
Table width — 24".  
Table length — 72".  
Also built in  
other sizes.  
Complete details are  
given in Bulletin HWG.



*Hill Hydraulic  
WAY GRINDER  
from operators side.  
Note convenience  
of all controls.*



- 1 Fully hydraulic table and cross-feed drive.
- 2 Independent spindle operation.
- 3 Massive over-all construction.
- 4 Rapid traverse and fine feed adjustment.
- 5 Quick setting device for spindle heads.
- 6 Convenient operator controls.
- 7 One-shot lubrication system.
- 8 Telescoping and tape way covers.
- 9 Magnetic chuck (optional).
- 10 Permanent Accuracy.



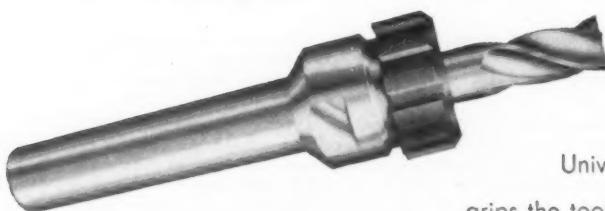
# THE HILL ACME COMPANY

1209 WEST 65th STREET • • • CLEVELAND 2, OHIO

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • "CLEVELAND" KNIVES • SHEAR BLADES

**FOR A REAL GRIP**

**USE  
UNIVERSAL  
COLLET CHUCKS**



A sure, solid grip on tools is provided by the wrap-around action of Universal chucks because the slotted collet

grips the tool on a continuous surface the full length

of the collet. Tools can't slip and tool shanks don't get scored.

Even tool stubs and broken drills can be used successfully. Sizes range from 1/16" to 1 1/2", with shanks to fit any machine.

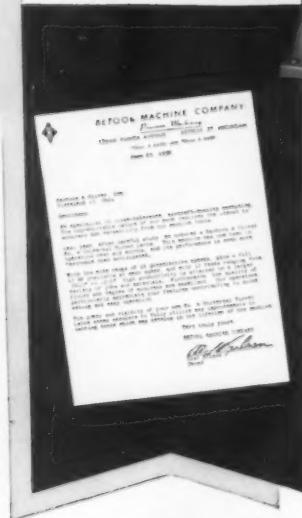
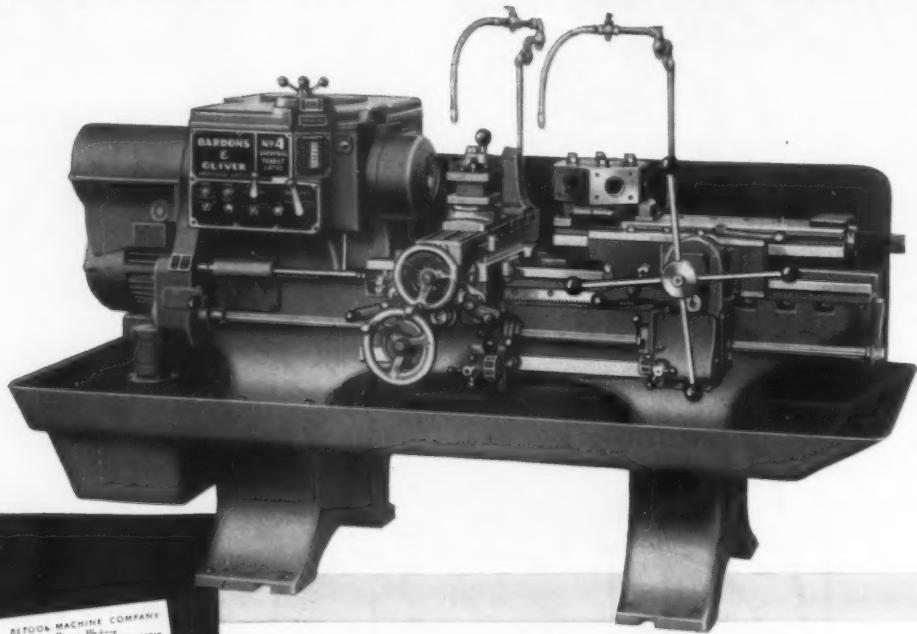
Simplified design results in low chuck cost to you. Write today for new "complete line" catalog.



**UNIVERSAL ENGINEERING CO. FRANKENMUTH 2, MICHIGAN**

MACHINERY, September, 1957—281

**RETOOL MACHINE COMPANY**  
selects the **BARDONS & OLIVER**  
**No. 4 Universal Turret Lathe because**  
**of its ACCURACY & VERSATILITY**



Mr. Olaf Nilson, owner of Retool Machine Company, Detroit, Michigan, has this to say about the No. 4 Universal Turret Lathe: "We specialize in close-tolerance, aircraft-quality machining. The unpredictable nature of our work requires the utmost in accuracy and versatility from our machine tools.

Last year, after careful study, we ordered a Bardons & Oliver No. 4 Universal Turret Lathe. This machine has now been in operation over six months, and its performance is even more favorable than anticipated.

With the wide range of 16 preselective speeds, plus a full 15 HP available at each speed, and with 12 feeds ranging from .0015" to .050", high productivity is attained on a larger variety of jobs and materials. Furthermore, the quality of finish and degree of accuracy are excellent. Our operators particularly appreciate your features contributing to quick set-up and easy operation.

The power and rigidity of your new No. 4 Universal Turret Lathe seems adequate to fully utilize any improvements in cutting tools which may develop in the lifetime of the machine."

Manufacturers of a complete line of Turret Lathes and Cutting-off Lathes

**BARDONS & OLIVER, INC.**  
1135 WEST 9TH STREET • CLEVELAND 13, OHIO

only  
**Heller**  
*Spiral cut*  
 HALF ROUND  
**FILES**

*Cut smooth, true arcs with straight strokes!*

**ROLLING ACTION IS BUILT IN!** With Heller SPIRAL-CUT Half Round Files stocked in tool cribs, even "green hands" can be put to work filing holes and concave surfaces. That's because no skilled twisting is required to prevent grooving, as with straight-row cut half rounds.

**20% MORE CUTTING POWER!** Heller's exclusive SPIRAL-CUT puts 20% more teeth to work than any other file of comparable size. So, production is speeded up.

**INDENTED OVER-CUT TRIPLES LIFE!** Heller's exclusive over-cutting process broadens the edges of up-cut teeth as much as three times . . . makes this a smoother cutting file . . . multiplies file life by three.

**PATENTED "WAVY TEETH" ON FLAT SIDE!** This unique Heller combination of coarse, fine and very fine teeth gives faster, smoother cutting than any other file of equal size and coarseness.

**COMPARE!** Heller Nucut SPIRAL-CUT Half Round Files, tested against all comers, invariably win out . . . and lead to better filing at lower costs.



### HOLLER FOR HELLER

*... and get  
more for your money!*

**HELLER EXPERIENCE . . .**  
more than 100 years of tailoring files to *all* job requirements . . . means that there's a Heller File that will give you more filing per dollar on any particular job. Check your Heller Distributor to be sure you get the right file for each job.

**SOLD EXCLUSIVELY THROUGH**



**SERVICE + STOCKS = SAVINGS**



**Heller  
Tool Co.**

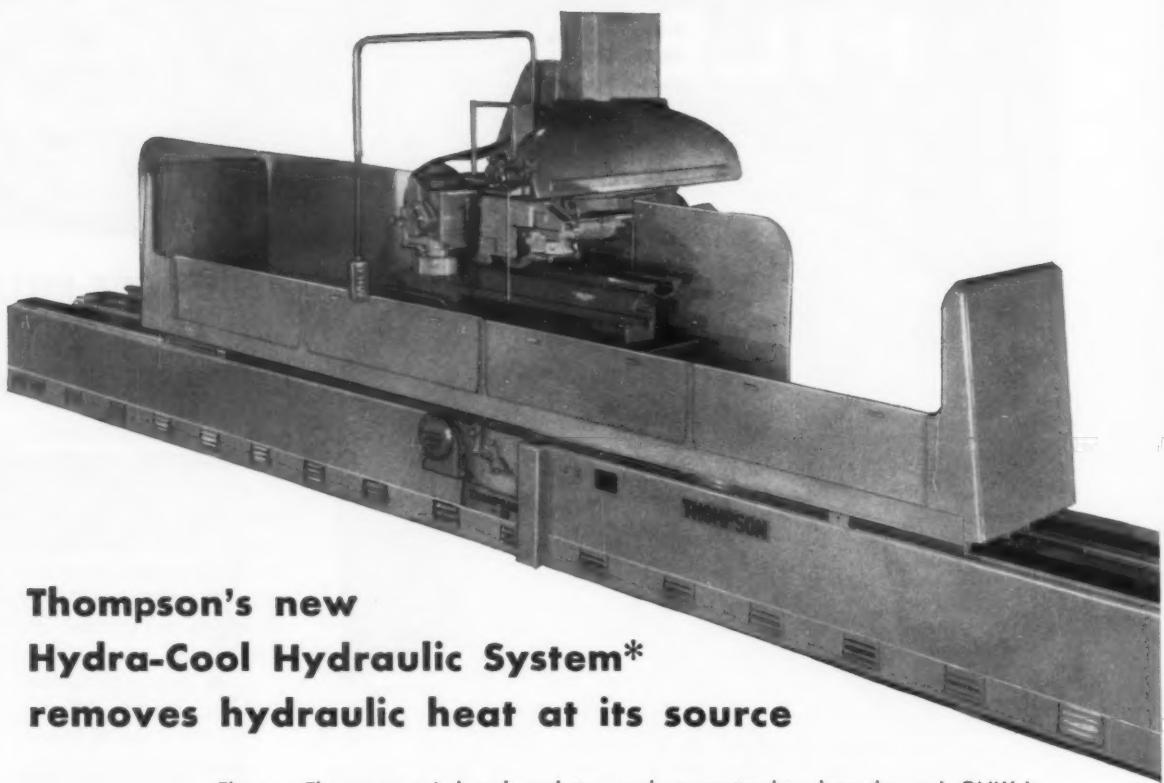
America's Oldest File Manufacturer

NEWCOMERSTOWN, OHIO

Subsidiary of Simonds Saw and Steel Co.



# HYDRA-COOL



## Thompson's new Hydra-Cool Hydraulic System\* removes hydraulic heat at its source

The new Thompsons grind cool—and stay cool—no matter how long the run! ONLY in this new hydraulic system can you get these important, exclusive advantages—

- Hydra-Cool eliminates heat damage to the hydraulic seals, valves, controls and pump.
- Hydra-Cool will not break down the additive-type hydraulic oils—sludge will not form in the Hydra-Cool System.
- Hydra-Cool eliminates the usual lengthy warm-up period required to bring production surface grinders up to working temperature.
- Hydra-Cool saves you money on power costs.

Hydra-Cool is standard on all Thompson surface grinders 40 inches and up in work length AT NO EXTRA COST.

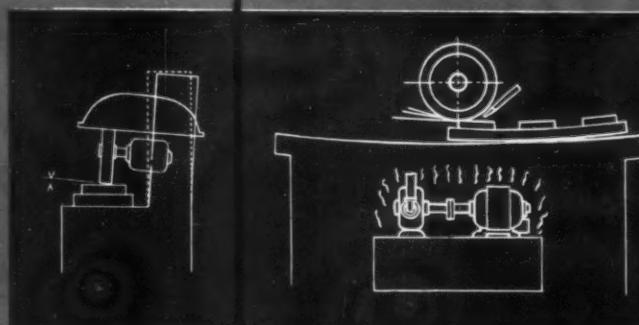
\*Pat. Applied For

"KEEP *Thompson* IN MIND FOR THAT DAILY GRIND"

# *Constant* ASSURES ACCURACY

## HEAT DISTORTION IS ELIMINATED IN THOMPSON SURFACE GRINDERS

As shown at right, heat distorts the column of a surface grinder from its true vertical alignment, causing the column to bend back from the work table. This further destroys the machine's accuracy.



### HOW HEAT DISTORTS A SURFACE GRINDER

Coolant, splashing and evaporating on the work table, cools the top surface, which contracts. Hydraulic heat, ranging from 50° to 70° above ambient temperatures, heats the bottom surface of the table, which expands. This causes the whole table to become concave. As shown in the exaggerated drawing above, any work being ground during this distortion is ground too heavily on the ends of the table and not enough in the middle. Surface flatness and parallelism cannot be maintained.

No more than a few degrees rise above ambient temperature is found in the Hydra-Cool System. Distortion is eliminated—accuracy is assured.

SEND FOR DESCRIPTIVE HYDRA-COOL FOLDER

**The Thompson Grinder Co.**  
12 Zeischler Street  
Springfield, Ohio, U. S. A.

**Thompson**  
SURFACE  
GRINDERS



WASHINGTON IRVING HAS NOTHING ON US!\*

\*Ichabod Crane and his Legend of Sleepy Hollow, originators of the throw-away head!



## T-J Reamers have throw-away heads, too!

### New Exclusive Design Cuts Replacement Costs More Than Half!

Exclusive in design . . . the New-type T-J Reamers cut your replacement costs *more than half!* Only the quickly installed head to replace, after buying original shank. Wide range of interchangeable heads from  $\frac{1}{2}$ " to  $2\frac{3}{4}$ " inclusive, in  $1/16$ " increments are available with right or left hand spiral flutes for thru or blind hole reaming.

Tapered hole in head insures con-

centricity and *new* thread design assures a snug fit on smoothly ground tapered shank. Reamer operates free from binding or sticking due to cutting portion wearing undersize and creating negative relief. Backed by T-J's 40 years of know-how as one of the largest manufacturers of die sinking milling cutters. Write to Tomkins-Johnson Co., 617 North Mechanic Street, Jackson, Michigan for T-J Catalog #153-1.



**TOMKINS-JOHNSON CO., Jackson, Mich.**

T-J

**TOMKINS-JOHNSON**

MACHINERY AIR AND HYDRAULIC CYLINDERS CUTTERS CLIMBERS

# FACTS ABOUT HOW PRODUCTION LAPPING SAVES YOU MONEY—IMPROVES YOUR PRODUCT

With the **Lapmaster® Principle**

The Lapmaster is a versatile precision machine engineered to production lap flat surfaces within tolerances of .0000116" or less and microinch finishes of 2 to 3 RMS with absolute uniformity. Here's how it works:

1. Heavy cast iron lap plate revolves slowly under power.
2. Large cast iron conditioning rings are held in position and rotate freely on the lap plate . . . continually keeping the plate flat and true.
3. Work pieces are placed inside the conditioning rings where they also rotate on the lap.
4. Fresh, sharp abrasive grains, suspended in a suitable vehicle, are continuously fed on the lap plate and uniformly distributed under the work pieces during the lapping action.

## WHY THE LAPMASTER IS TRULY A PRODUCTION MACHINE

Identical parts or parts of various shapes, heights and materials can be lapped simultaneously on one machine.

Production is not interrupted or slowed down for replacing or reconditioning lap plates.

Simplicity of design with no obstructions makes loading and unloading easy and simple.

Exclusive design and method of operation with greater effective lapping area permits more loadings per cycle.

Short, predetermined lapping cycles are automatically controlled by a timing clock for greater production efficiency.

Automatic cycling permits pre-loading additional work holders while machine is in operation.

## HOW COSTS ARE CUT...PRODUCT IMPROVED

These excerpts from letters sent in by actual Lapmaster users tell the story better than our own words.

"... never been a reject from the work performed on this machine."

"... gives us better quality with less scrap and reduced labor costs."

"... maintenance costs only approximately \$85.00 whereas old method was costing approximately \$8000.00 per year."

"... machine will save its costs in 2 years by salvaging the mechanical seals for us which would otherwise have been discarded."

"... have dispensed altogether with tests for leakage."

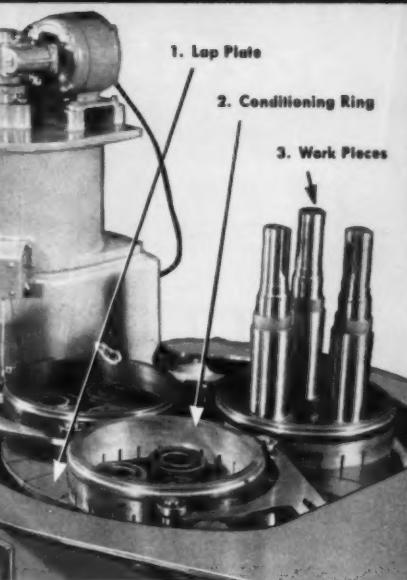
"... the Lapmaster has more than paid for itself—we've eliminated a finish grinding operation and save on expensive fixturing."

## HOW DOWNTIME IS ELIMINATED

The Lapmaster is the only lapping machine that does not have to be stopped for redressing or truing the lap plate. Flatness of the lap plate is continually maintained by the patented reconditioning action of the conditioning rings.

## WHAT ABOUT PART SIZE AND SHAPE?

Standard machines in the Lapmaster Line will handle parts from  $\frac{1}{8}$ " up to  $30\frac{1}{2}$ ". Shape or form is not a problem



... tall or squat, long or short, flat or odd shaped . . . all are being lapped on Lapmasters throughout industry. Monel, steel, tool steel, bronze, cast iron, stainless steel, aluminum, brass, quartz, ceramics, plastics, etc. can all be lapped with the same lap plate.

## OPERATOR NEED NOT BE EXPERIENCED

Unskilled operators can be used since the only manual work required is loading and unloading the pieces.

## PROVE IT TO YOURSELF WITH THE LAPMASTER TECHNICAL SERVICE

One sure way to find out if the Lapmaster can save you money is to send us samples and surface finish specifications of parts. We'll test run them in our experimental lapping laboratory and furnish you with a complete production report without obligation. Or write for FREE Booklets with complete facts on producing and measuring precision flatness and finish.



Crane Packing Co., 6433 Oakton St., Morton Grove, Ill. (Chicago Suburb). In Canada: Crane Packing Co., Ltd., Hamilton, Ont.



MECHANICAL PACKINGS

SHAFT SEALS

TEFLON PRODUCTS

LAPPING MACHINES

THREAD COMPOUNDS

**CRANE PACKING COMPANY**

# The Most Economical

WITH SHEFFIELD'S  
PRECISIONAIRE

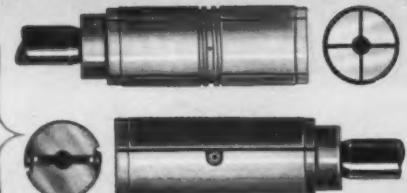


The MOST  
USABLE  
OF ALL  
AIR GAGES

## CHARACTERISTICS

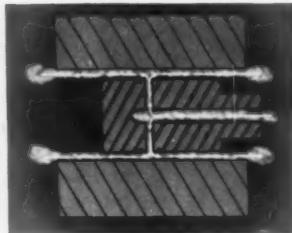
- High precision with instant response
- Has widest amplification range — 100 to 100,000-1
- Accommodates widest tolerance range — .000005 to .100
- Amplifications and tooling interchangeable
- Provides quickest change in amplification
- Longer scale facilitates classifying parts and provides greater approach range
- Easier to read — no need to squat and squint
- Human error minimized
- Checks one dimension or many simultaneously
- Elements have long service life

BASIC  
INTERNAL  
TOOLING  
ELEMENTS

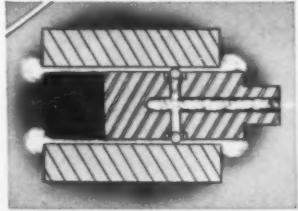


AIRJET SPINDLE

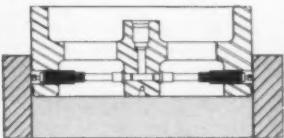
For True  
Diameter



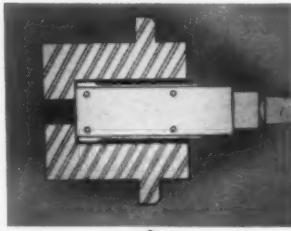
Standard stock spindle with two diametrically opposed open jets for holes having tolerances of .005" or less and surface finishes of less than 65 rms.



Balljet Spindles used for holes in porous or soft materials and for internal surfaces rougher than 65 rms.



Plunjets mounted in a suitable fixture are used for larger holes and those having larger tolerances.

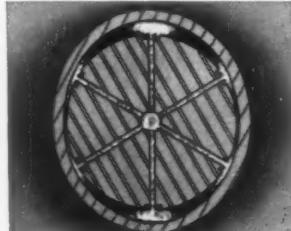


Bladejet Spindles are used in interrupted bores, bores having a keyway, to gage to the very bottom of a blind bore and for larger tolerance bores.



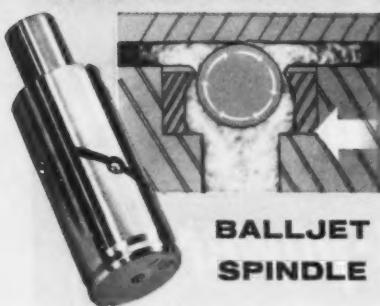
Adjustable spindles and kits are available to cover ranges of  $\frac{3}{8}$ " to  $\frac{7}{8}$ ";  $\frac{1}{8}$ " to  $1\frac{1}{2}$ "; 1" to 3";  $1\frac{1}{2}$ " to 3" and 3" to 12".

For  
Average  
Diameter



Spindles having three or more jets equally spaced around the perimeter—especially effective in checking thin wall components.

# Way to Gage Holes\*



**BALLJET  
SPINDLE**

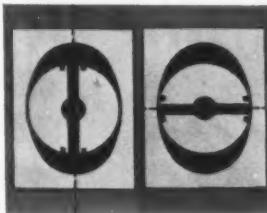


**BLADEJET  
SPINDLE**



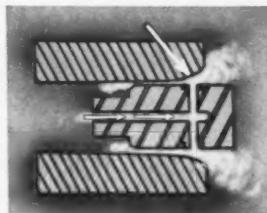
**PLUNJET  
CARTRIDGES**

## For Out-of-Round



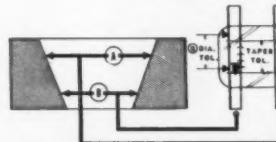
Indicated when any spindle is rotated through 90 degrees.

## For Bell-Mouth



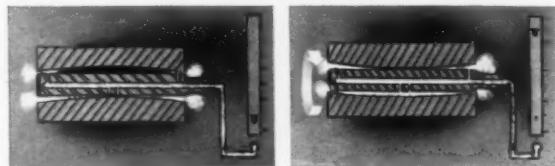
Indicated as any spindle enters or is withdrawn from the bore.

## For Taper



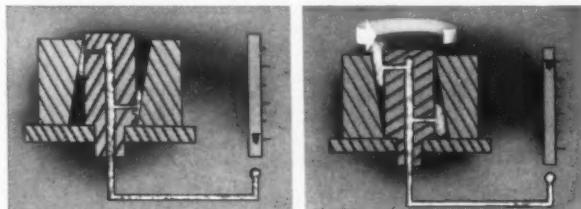
Indicated as any spindle is passed through the bore. Spindles having two or more sets of jets may also be used. In larger bores and/or those having larger tolerances, Plunjets in a suitable fixture are used.

## For Camber



Camber or straightness of a hole is checked by rotating through 180° a spindle having four jets as indicated.

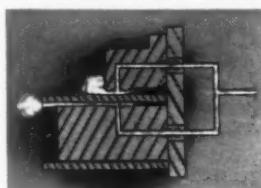
## For Squareness of a Bore Axis with a Face



Spindle with opposed open orifices spaced longitudinally checks squareness of a bore axis with a face.

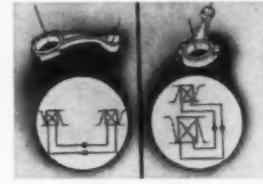
Plunjets fixtures may also be used.

## For Concentricity



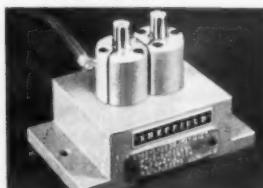
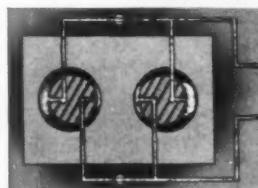
Opposed jets in a locating fixture.

## For Parallelism of Holes



By integrating two spindles in a fixture, such as those used for squareness checking.

## For Center Distance Between Holes



By a fixture with two spindles each having two opposed jets.

\*For checking external dimensions, relationships and countless other conditions, write to Div. 9, **THE SHEFFIELD CORPORATION, Dayton 1, Ohio, U.S.A.**

the **SHEFFIELD** corporation  
MANUFACTURERS AND IMPORTERS OF AIR GAGES AND INSTRUMENTS FOR MANUFACTURE AND MEASUREMENT FOR MANKIND

THAN ALL OTHER MAKES OF AIR GAGES



New  
Atomic-powered  
"SKATE"  
equipped with  
**Fulflo**  
FILTERS

Photo courtesy of General Dynamics Corp.

When the *Skate*, U. S. Navy's newest atomic submarine, slid down the ways, she was equipped with Fulflo Filters.

When you need dependable micronic filtration, you, too, can rely on Fulflo Filters. They are engineered to your exact requirements — for all types of industrial fluids: oils; liquid chemicals; water; liquid

fuels; lacquers, paints, thinners; compressed air, CO<sub>2</sub> and other gases. Standard models meet all normal operating conditions. Special filters can be engineered for full-flow filtration up to 2000 gpm or pressures as high as 5000 psi, at minimum pressure drop. Wide variety of filter elements and containers is available.

*Call on Commercial for dependable micronic filtration. For technical literature or engineering assistance, address Department MA.*

**Micro-Fine Filtration  
for Low Cost Clarity**



**COMMERCIAL FILTERS CORPORATION**

MELROSE 76, MASSACHUSETTS

Plants in Melrose, Massachusetts and Lebanon, Indiana

FULFLO FILTERS WITH GENUINE HONEYCOMB FILTER TUBES FOR CONTROLLED MICRONIC CLARITY • CFC MULTI-CARTRIDGE OIL FILTERS  
PURIVAC INSULATING OIL CONDITIONERS • DRI-PURE WATER-OIL SEPARATORS • PRE-COAT FILTERS • MAGNETIC SEPARATORS  
AUTOMATIC TUBULAR CONVEYORS • COOLANT CLARIFIERS

# NOW—Put a Set of Gage Blocks in the hands of each of your machinists

## MEMO TO MANAGEMENT:

### PUT YOUR SHOP ON A SINGLE MEASUREMENT STANDARD

A significant improvement for complete and over-all Quality Control in your plant is now practical and reasonable in cost.

It is of such value that many companies have decided to equip their toolmakers, machinists and inspection personnel with a personal set of the DoALL Shop-Blocks. Product quality goes up—waste and re-work costs are reduced.

In a cooperative program for companies who have taken this interest we have established, for a limited period, quantity discounts to make this "single measurement standard" possible in any size plant.

We urge you to consider this for your plant.  
It can prove to be one of your best investments.

**NEW**

**DoALL**  
**SHOP-BLOCKS**



DoALL Shop-Blocks meet the realities of today's precision tolerances required right at the bench, job or machine. They represent DoALL's decision to completely discontinue manufacture of B grade blocks as inadequate for today's dimensional control needs. They provide working accuracies that will save you valuable time, effort and waste . . . give better control needed for shop measurements.

#### "A" Grade Working Gage Blocks at less than "B" Grade Prices

Accuracy:  $\pm .000006"$   
 $-.000002"$

Finish: 0.8 AA or better

Flatness: .000004"

Parallelism: .000004"

Hardness: 65 Rc

The Only "A" Grade Working Gage Block Available Today!



These blocks are available from stock today. Ask for literature. Call your local DoALL Store, or write.

**The DoALL Company,**  
Des Plaines, Illinois



#### SET NO. 860

84 pieces

Only \$265.00\*

.0001" Series—9 Blocks .1001" thru .1009"  
.001" Series—49 Blocks .101" thru .149"  
.050" Series—19 Blocks .050" thru .950"  
1.000" Series—4 Blocks 1.000" thru 4.000"  
Quarter tenth Series—3 Blocks .100025",  
.100050", .100075"

\*Discounts on purchase of 10 and 50 or more sets.

\*.050" or .100" steel or carbide wear blocks available at slight extra cost.

#### SET NO. 380

36 pieces

Only \$130.00\*

.0001" Series—9 Blocks .1001" thru .1009"  
.001" Series—9 Blocks .101" thru .109"  
.010" Series—9 Blocks .110" thru .190"  
.100" Series—5 Blocks .100" thru .500"  
1.000" Series—3 Blocks 1.000", 2.000", 4.000"  
Half tenth Series—1 Block .10005"

THIS IS A  
TYPICAL DoALL STORE



# Product Directory

To find headings easily, look for capital letters at top of each page to denote location.

## ABRASIVE CLOTH, Paper and Belt

Crane Packing Co., Morton Grove, Ill.

Gardner Machine Co., Beloit, Wis.  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Simonds Abrasive Co., Tocony and Fraley Sts.,  
Bridgesburg, Philadelphia, Pa.

Norton Co., 1 New Bond St., Worcester 6, Mass.  
Simonds Abrasive Co., Tocony and Fraley Sts.,  
Bridgesburg, Philadelphia, Pa.

## ABRASIVES, Discs

Carborundum Co., Niagara Falls, N. Y.  
Delta Power Tool Div., 400 N. Lexington Ave.,  
Pittsburgh 8, Pa.

ABRASIVES, Polishing, Tumbling, Etc.  
Crane Packing Co., Morton Grove, Ill.

## ACCUMULATORS, Hydraulic

Watson-Stillman Co., Roselle, N. J.



Heavy Duty Vertical  
Milling Attachment



Heavy Duty Offset  
Vertical Milling Attachment



Universal Milling Attachment



Toolmakers Overarm

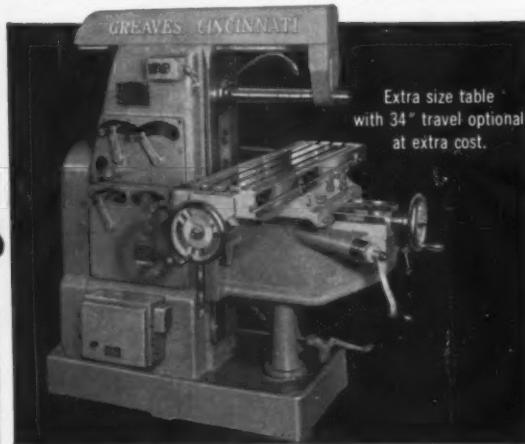
**Heavy duty attachments  
increase versatility  
of dependable, low-cost**

## GREAVES MILLS

"THE MOST MILL FOR THE LEAST MONEY"

A full line of attachments and accessories offer outstanding flexibility for all types of milling operations . . . with GREAVES MILLS.

Make your own comparison of 22 specifications of Greaves and 7 other leading milling machines.



**GREAVES MACHINE TOOL CO.**  
**2500 Eastern Avenue, Cincinnati 2, Ohio**  
Send Comparison Chart. I will make my own comparison of GREAVES MILLS with other makes.  
Send information on Attachments and Accessories for GREAVES MILLS.

|         |       |       |
|---------|-------|-------|
| NAME    | TITLE |       |
| FIRM    |       |       |
| ADDRESS |       |       |
| CITY    | ZONE  | STATE |



## AIR GAGES, Dimensional—See Gages Air Comparator

## AIR GUNS

Chicago Pneumatic Tool Co., New York 17,  
N. Y.  
Schrader's Sons, A., 470 Vanderbilt Ave.,  
Brooklyn 38, N. Y.

## AIR TOOLS—See Grinders, Portable, Pneumatic,—Drills, Portable, Pneumatic, Etc.

## ALLOY STEELS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Bethlehem Steel Co., Bethlehem, Pa.  
Carpenter Steel Co., Reading, Pa.  
Columbia Tool Steel Co., Chicago Hts., Ill.  
Crucible Steel Co. of America, Oliver Bldg.,  
Pittsburgh 30, Pa.  
Ryerson Joseph T. & Son, Inc., 2558 W. 16th  
St., Chicago 18, Ill.  
U. S. Steel Corp., Carnegie-Illinois Steel Corp.  
Div., 436 7th Ave., Pittsburgh, Pa.  
Vanadium Alloys Steel Co., Latrobe, Pa.  
Wheelock, Lovejoy & Co., Inc., Cambridge,  
Mass.

## ALLOYS, Bearing

Bunting Brass & Bronze Co., 715 Spencer  
Toledo 1, Ohio  
Carpenter Steel Co., 105 W. Bern St., Reading,  
Pa.  
Crucible Steel Co. of America, Henry W. Oliver  
Bldg., Mellon Square, Pittsburgh 22, Pa.  
Mueller Brass Co., Port Huron, Mich.

## ALLOYS, Non-ferrous—See Brass, Copper, Zinc and Stellite

## ALUMINUM and Aluminum Products

Mueller Brass Co., Port Huron, Mich.  
Revere Copper & Brass, Inc., 230 Park Ave.,  
New York 17, N. Y.  
Ryerson & Son, Jos. T., 16th & Rockwell Sts.,  
Chicago 8, Ill.

## ANGLE PLATES—See Set-Up Equipment

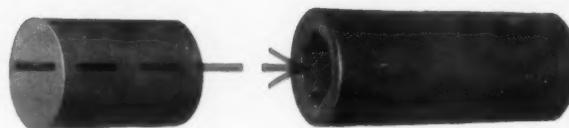
## ANNEALING FURNACES

Eisler Engrg. Co., 750 So. 13th St., Newark 3,  
N. J.  
General Electric Co., Schenectady, N. Y.  
Holcroft & Co., 6545 Epworth Blvd., Detroit  
10, Mich.

## AUTOMOBILE TORSION BAR ANCHOR HOUSINGS

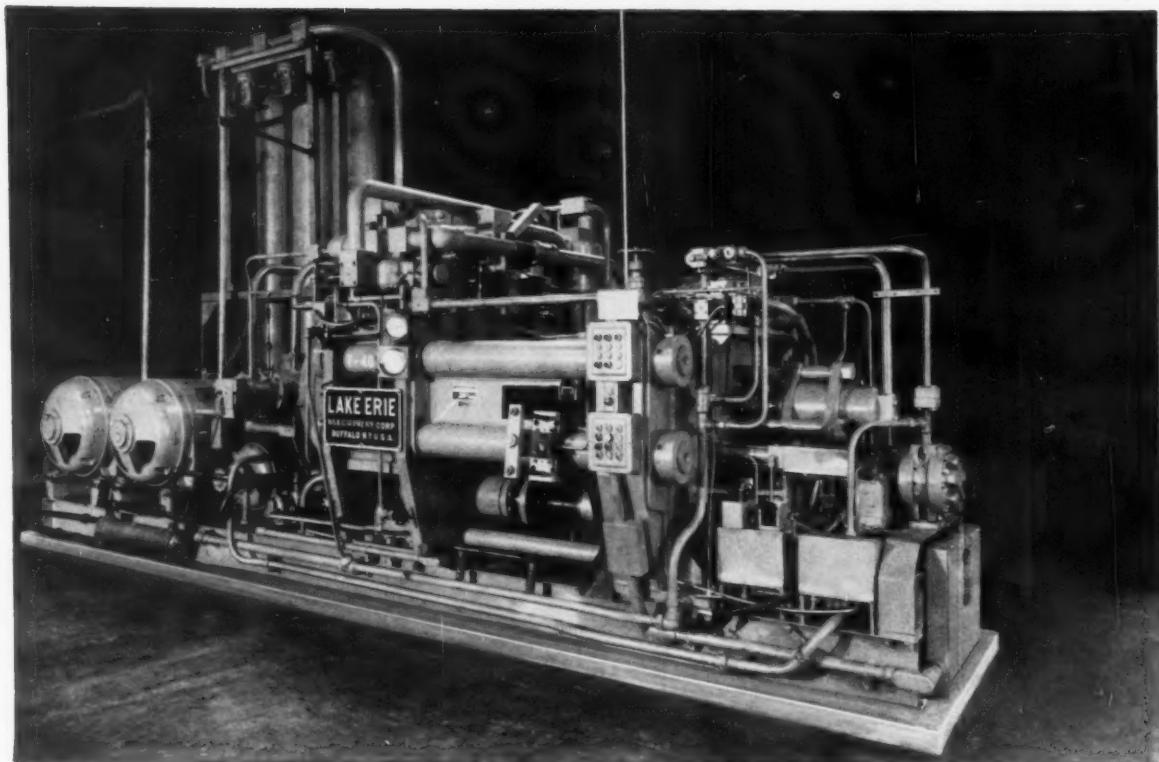
# Automatically cold extruded

FROM  
1035 —  
STEEL



## at a rate of 525/HR\*

\*Approximately 3 times screw machine production rate



- 40% of material saved
- Concentricity held to .010" total indicator reading
- Machining and labor costs greatly reduced
- Cold working eliminates heat treatment
- Physicals of finished piece improved

An experienced Lake Erie engineer will be glad to discuss material-saving, labor-saving, money-saving cold extrusion with you. He's as close as your phone.

**PRESS AND  
TOOLING BY  
LAKE ERIE**

**LAKE ERIE  
HYDRAULIC  
PRESSES**

LAKE ERIE MACHINERY CORPORATION, successor to

**LAKE ERIE ENGINEERING CORPORATION**

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Manufacturers of the Most Complete Line of Hydraulic Presses for All Industry

LAKE ERIE®

DIRECTOMAT®

# Have you seen our BIG NOs?

save time and cost with Laminum Shims

**NO** machining



**NO** grinding



**NO** counting



**NO** stacking



**NO** miking



and  
**NO** dirt  
between  
layers—  
ever

And only in Laminum are  
laminated, surface-bonded  
shims available in all four  
materials as shown below.



Laminated Shims of  
**LAMINUM**  
now available in

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|---|--|
| STAINLESS<br>STEEL<br>with laminations<br>of .002" or .003" | LOW CARBON<br>STEEL<br>with laminations<br>of .002" or .003" |
| BRASS<br>with laminations<br>of .002" or .003"              | ALUMINUM<br>with laminations<br>of .003" only                |

**LAMINATED SHIM COMPANY, INC.**

Shim headquarters since 1913  
3909 Union Street, Glenbrook, Conn.

For more information fill in page number on Inquiry Card, on page 255

294—MACHINERY, September, 1957

**ARBOR PRESSES**—See Presses Arbor

## ARBORS AND MANDRELS

Brown & Sharpe Mfg. Co., Providence, R. I.  
Chicago-Latrobe, 411 W. Ontario St., Chicago  
10, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St.,  
Cleveland, Ohio  
Jacobs Mfg. Co., West Hartford, Conn.  
Kearney & Trecker Corp., Milwaukee 14, Wis.  
Logansport Mch. Co., Inc., Logansport, Ind.  
South Bend Lathe Wks., South Bend 22, Ind.  
Wesson Co., 1220 Woodward Heights Blvd.,  
Ferndale, Mich.  
Whitman & Barnes, 40600 Plymouth Rd.,  
Plymouth, Mich.

**ARC WELDERS**—See Welding Equipment, Arc

## ASSEMBLING MACHINES

Ingersoll-Rand Co., 11 Broadway, New York 4,  
N. Y.  
Robbins, Omer E. Co., 24800 Plymouth Rd.,  
Detroit 39, Mich.

**AUTOMATIC SCREW MACHINES**—See  
Screw Machines, Single- and Multiple-  
Spindle Automatic

## AUTOMATION EQUIPMENT

Wilson Automation, P.O. Box 3855, Detroit 5,  
Mich.

## BABBITT

Ryerson, Jos. T. & Son, 2558 W. 16th St.,  
Chicago 18, Ill.

## BALANCING EQUIPMENT

Gisholt Machine Co. (Static and Dynamic),  
1245 E. Washington Ave., Madison 10,  
Wis.  
LaSalle Tool, Inc., 3840 E. Outer Dr., Detroit  
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Mich.  
Bunting Brass & Bronze Co., 715 Spencer,  
Toledo, Ohio.  
Centrifugally Cast Products Div., Shenango  
Furnace Co., Dover, Ohio.  
Mueller Brass Co., Port Huron, Mich.  
Ryerson, Jos. T. & Son, 2558 W. 16th St.,  
Chicago 18, Ill.

## BAR STOCK AND SHAFTING, Steel

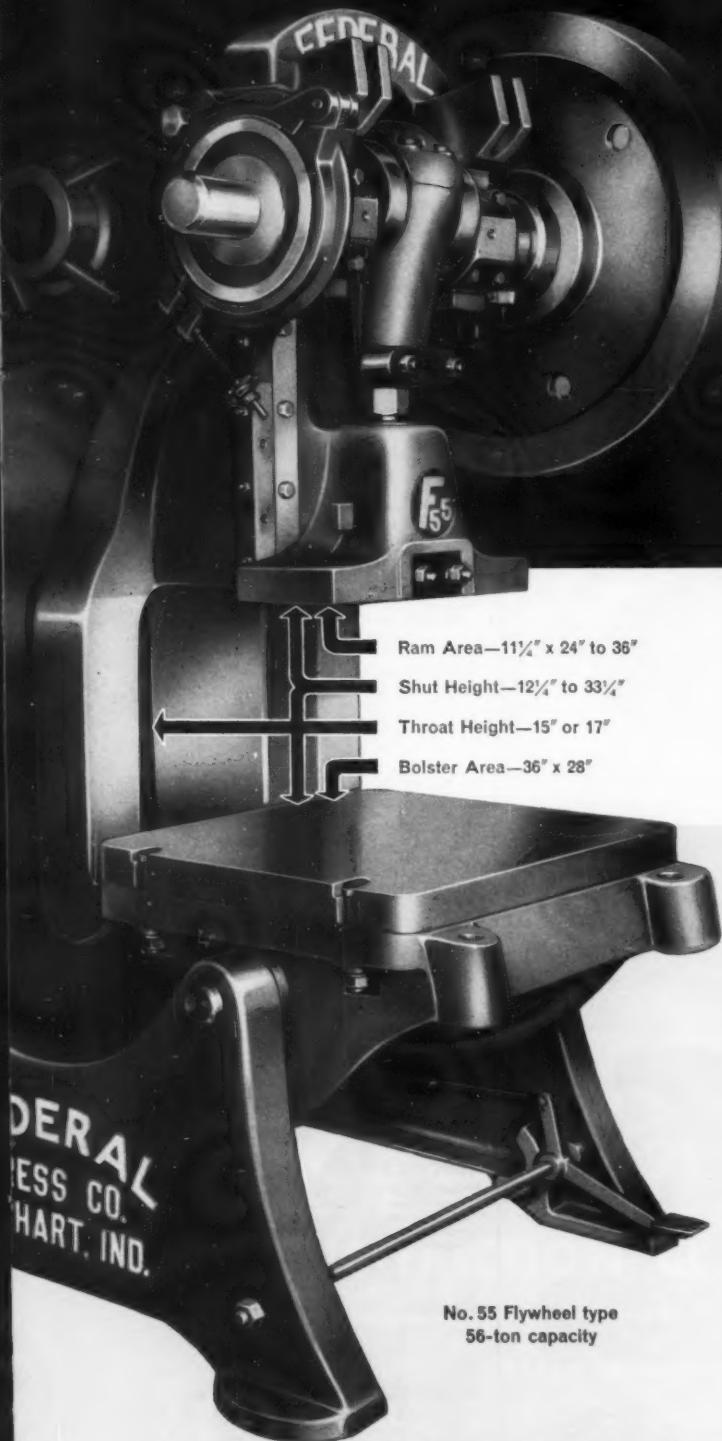
Bethlehem Steel Co., 701 East Third St.,  
Bethlehem, Pa.  
Boston Gear Works, 14 Hayward St., Quincy  
71, Mass.  
Carpenter Steel Co., 105 W. Bern St., Reading,  
Pa.  
Crucible Steel Co. of America, Henry W.  
Oliver Bldg., Mellon Sq., Pittsburgh 22, Pa.  
Cumberland Steel Co., Cumberland, Md.  
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New Departure Div., Bristol, Conn.  
Nice Ball Bearing Co., 30th & Hunting Park Ave., Philadelphia, Pa.  
Norma-Hoffman Bearings Corp., Stamford, Conn.

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Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

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Norma-Hoffman Bearings Corp., Stamford, Conn.  
Orange Roller Bearing Co., Inc., Orange, N. J.  
Railway Bearings Co., Inc., 541 Seymour St., Syracuse, N. Y.  
Timken Roller Bearing Co., Canton, Ohio.

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Centrifugally Cast Products Div., Shenango Furnace Co., Dover, Ohio.  
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General Electric Co., Schenectady, N. Y.  
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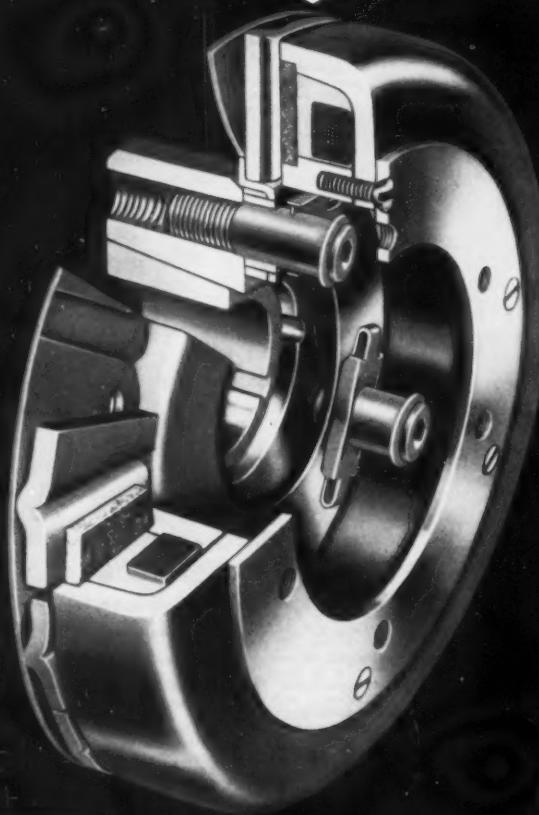
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Smith, R. E., Waukegan, Ill.  
(Continued on page 298)

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Homestrand, Inc., Larchmont, N. Y.  
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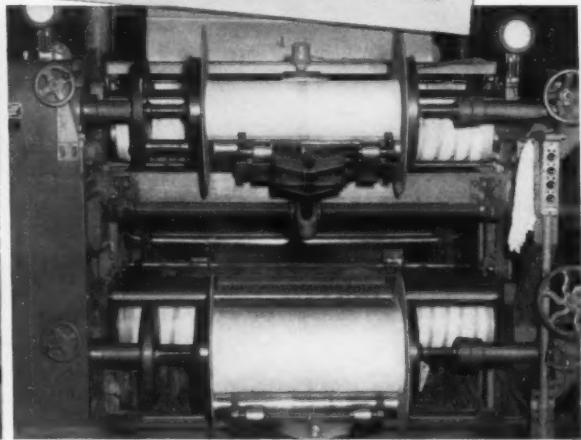
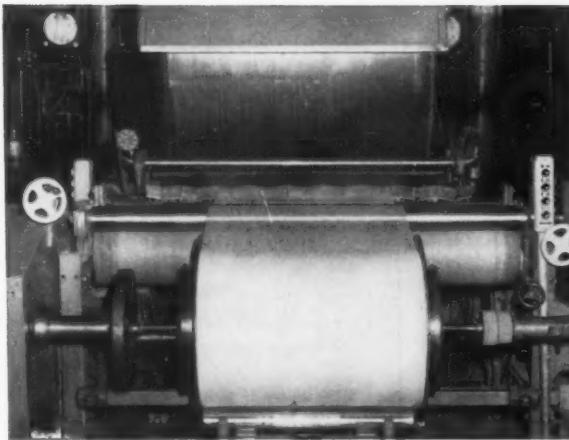
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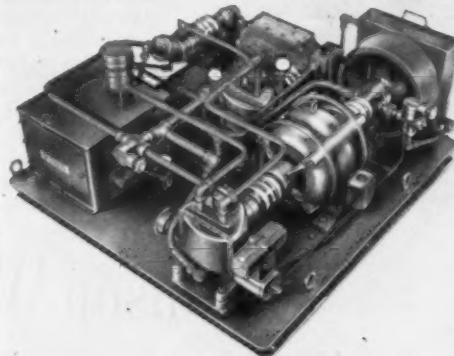
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Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
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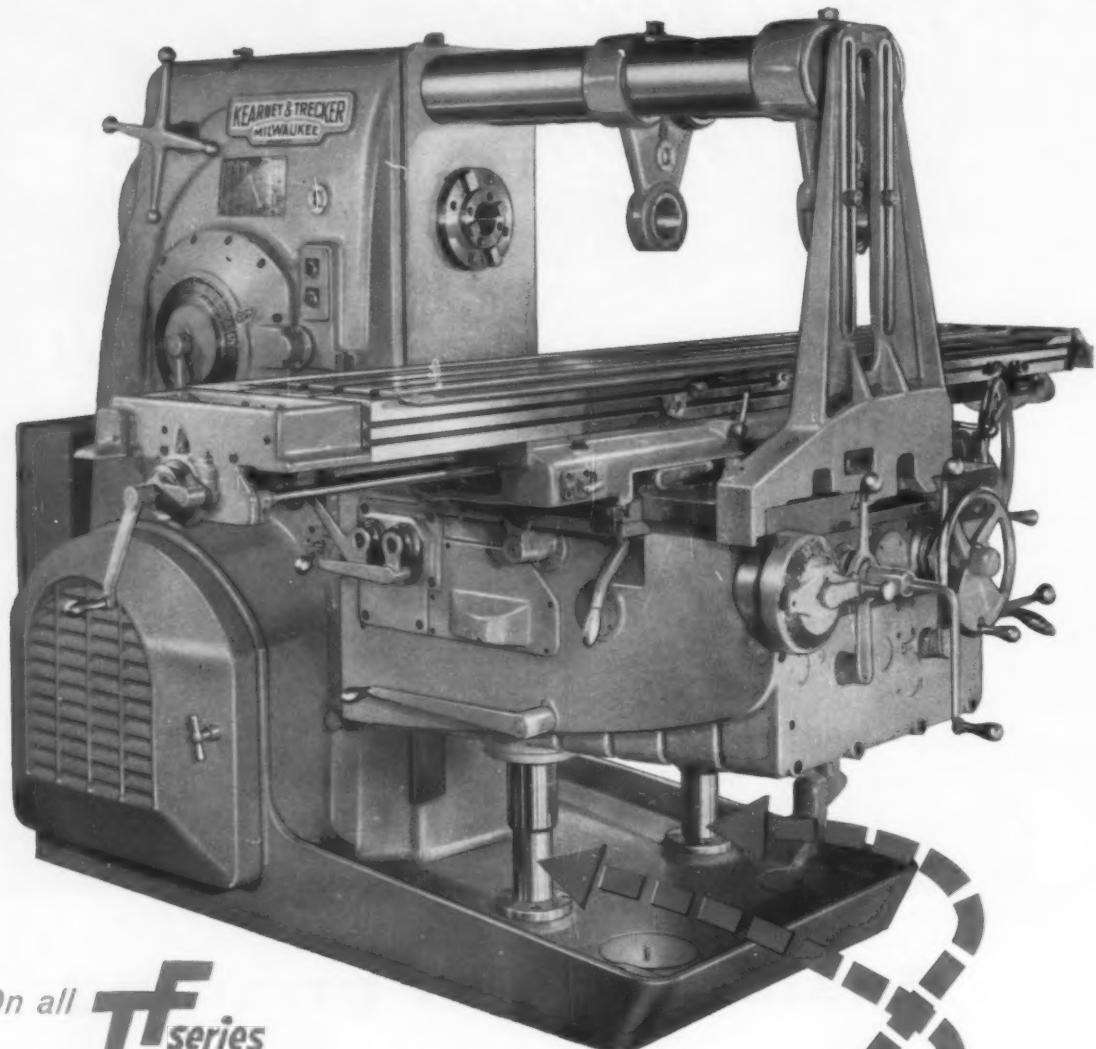
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**LOS ANGELES, CALIF.**  
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6784 W. National Ave.

**ROCHESTER 4, N. Y.**  
Syracuse Supply Co.  
311 Alexander Street

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Blackman & Nuetzel  
Machinery Co.  
3713 Washington Ave.

**ST. PAUL, MINN.**  
Sales Serv. Mach. Tool Co.  
2363 University Ave.

**SALT LAKE CITY, UTAH**  
Todd Machinery Co.  
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Moore Machinery Co.  
7th & Carleton-Berkeley

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Moore Machinery Co.  
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Dawson Mach. Co.  
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**SHREVEPORT, LA.**  
Peerless Supply Co., Inc.  
701 Spring St.

**SYRACUSE 1, N. Y.**  
Syracuse Supply Co.  
314-332 W. Fayette St.

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White Star Mach. Co.  
104 Boulder Bldg.  
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Williams & Wilson Ltd.

### BROACHING MACHINE, Internal

American Broach & Mch. Co., Ann Arbor,  
Mich.  
Colonial Broach & Machine Co., P. O. Box 37,  
Harper Sta., Detroit 13, Mich.  
Detroit Broach Co., Rochester, Mich.  
Lapointe Mach. Co., Tower St., Hudson,  
Mass.  
Sundstrand Mch. Tool Co., 2531—11th St.,  
Rockford, Ill.  
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

### BROACHING MACHINE, Surface

American Broach & Mch. Co., Ann Arbor,  
Mich.  
Cincinnati Milling and Grinding Mchs., Inc.,  
Cincinnati, Ohio.  
Colonial Broach & Machine Co., P. O. Box 37,  
Harper Sta., Detroit 13, Mich.  
Detroit Broach Co., Rochester, Mich.  
Foot-Burt Co., 13000 St. Clair Ave., Cleve-  
land 8, Ohio.  
Lapointe Mach. Co., Tower St., Hudson,  
Mass.  
Sundstrand Mch. Tool Co., 2531—11th St.,  
Rockford, Ill.

### BRONZE

American Brass Co., Waterbury 20, Conn.  
Bridgeport Brass Co., Bridgeport, Conn.  
Mueller Brass Co., Port Huron 35, Mich.

### BRUSHES, Industrial, Tampico, Wire Wheel, Etc.

Delta Power Tool Div., 400 N. Lexington Ave.,  
Pittsburgh 8, Pa.  
Osborn Mfg. Co., 5401 Hamilton Ave., Cleve-  
land, Ohio.

### BUFFERS

Delta Power Tool Div., 400 Lexington Ave.,  
Pittsburgh 8, Pa.  
Pittsburgh Plate Glass Co., Brush Div., Balti-  
more 29, Md.  
Standard Electrical Tool Co., 2488-90 River  
Rd., Cincinnati, Ohio.

### BULLDOZERS, Metalforming

Birdsboro Steel Foundry & Machine Co.,  
Birdsboro, Pa.  
Elmes Eng. Div., American Steel Foundries,  
1150 Tennessee Ave., Cincinnati 29, Ohio.  
Farquhar Div., A. B., 142 N. Duke St., York,  
Pa.  
Lake Erie Machinery Corp., 470 Woodward  
Ave., Buffalo 17, N. Y.  
Watson-Stillman Co., Roselle, N. J.

### BURNISHING MACHINES

Baldwin-Lima-Hamilton Corp., Lima Hamilton  
Div., Hamilton, Ohio.  
Russell, Holbrook & Henderson, Inc., 292 Madison  
Ave., New York 17, N. Y.

### BURRING MACHINES—See Deburring Machines

### BURRS—See Files and Burrs, Rotary

### BUSHINGS, Drill Jig

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit  
32, Mich.  
Metal Carbides Corp., 6001 Southern Blvd.,  
Youngstown 12, Ohio.  
Universal Engrg. Co., Frankenmuth, Mich.

### BUSHINGS, Hardened Steel

Universal Engrg. Co., Frankenmuth, Mich.

### BUSHINGS, Non-ferrous and Powdered Metal

American Crucible Products Co., Lorain, Ohio.  
Bunting Brass & Bronze Co., 715 Spencer,  
Toledo, Ohio.  
Universal Engrg. Co., Frankenmuth, Mich.

### CABINETS, Tool

Standard Pressed Steel Co., Jenkintown, Pa.

### CALIPERS, Spring, Firm-Joint, Transfer, Hermaphrodite, etc.—See Layout and Drafting Tools, Machinists' Small Tools

### CALIPERS, Vernier

Brown & Sharpe Mfg. Co., Providence, R. I.  
DoAll Co., Des Plaines, Ill.  
Scherr, George, Co., Inc., 200 Lafayette St.,  
New York 12, N. Y.  
Starrett, The L. S. Co., Athol, Mass.

### CAM CUTTING MACHINES

Cincinnati Milling and Grinding Mchs., Inc.,  
Cincinnati 9, Ohio.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jer-  
sey City 2, N. J.  
Pratt & Whitney Co., Inc., West Hartford,  
Conn.  
Russell Holbrook & Henderson, Inc., 292  
Madison Ave., New York 17, N. Y.  
Sundstrand Mch. Tool Co., 2531—11th St.,  
Rockford, Ill.  
Van Norman Mch. Co., 3640 Main St., Spring-  
field 7, Mass.

### CAM MILLING AND GRINDING MACHINES

American Schiess Corp., 1232 Penn Ave.,  
Pittsburgh 22, Pa.  
Baird Machine Co., 1700 Stratford Ave., Strat-  
ford, Conn.  
Cincinnati Milling Machine Co., Oakley, Cin-  
cinnati, Ohio.  
Landis Tool Co., Waynesboro, Pa.  
Rowbottom Machine Co., Waterbury, Conn.

### CAMS

Brown & Sharpe Mfg. Co., Providence, R. I.  
Eisler Engrg. Co., Inc., 750 S. 13th, Newark 3,  
N. J.  
Hartford Special Machinery Co., 287 Home-  
stead St., Hartford, Conn.  
Rowbottom Machine Co., Waterbury, Conn.

### CARBIDES

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Chicago-Latrobe, 411 W. Ontario St., Chicago  
10, Ill.  
DoAll Co., Des Plaines, Ill.  
Kennametal, Inc., Latrobe, Pa.  
Linde Co., 30 E. 42nd St., New York 17, N. Y.  
Metal Carbides Corp., Youngstown, Ohio.  
Metallurgical Products Dept. of General Elec-  
tric Co., Box 237, Roosevelt Park Annex,  
Detroit 32, Mich.  
Vacoloy-Ramet Corp., Waukegan, Ill.  
Wesson Co., 1220 Woodward Heights Blvd.,  
Ferndale, Mich.

### CASTINGS, Die

American Brass Co., Waterbury 20, Conn.  
Madison-Kipp Corp., Madison, Wis.

### CASTINGS, Non-ferrous

American Crucible Products Co., Lorain, Ohio.  
Bethlehem Steel Co., 701 East Third St.,  
Bethlehem, Pa.  
Centrifugally Cast Products Div., Shenango  
Furnace Co., Dover, Ohio.  
Dow Chemical Co., Midland, Mich.  
Mueller Brass Co., Port Huron 35, Mich.  
Vacoloy-Ramet Corp., Waukegan, Ill.

### CASTINGS, Gray Iron, Malleable

Bethlehem Steel Co., 701 East Third St.,  
Bethlehem, Pa.  
Centrifugally Cast Products Div.—Shenango  
Furnace Co., Dover, Ohio.  
Hill Acme Co., 1201 W. 65th St., Cleveland 2,  
Ohio.  
Kaukauna Machine & Foundry Div., Giddings  
& Lewis Machine Tool Co., Kaukauna, Wis.  
Sundstrand Mch. Tool Co., 2531 11th St.,  
Rockford, Ill.



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Santos Dumont was not a place, but a person — from Brazil. He gained a great deal of attention in 1907, when he flew an aeroplane a distance of 235 yards in 21 seconds — carrying a passenger! This historic flight took place in Paris, and was "news" all over the world. Curiously enough, few people at that time were aware of the Wright brothers' history-making flight at Kitty Hawk in 1903; most people then thought of "aviation" as floating about in balloons or dirigibles. It was something you watched at the County Fair — or perhaps at the International Bennett Cup Race.

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Bethlehem Steel Co., 701 East Third St.,  
Bethlehem, Pa.  
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.  
Crucible Steel Co. of America, Henry W.  
Oliver Bldg., Pittsburgh 22, Pa.

Seneca Falls Mch. Co., Seneca Falls, N. Y.  
Sundstrand Mch. Tool Co., 2531 11th St.,  
Rockford, Ill.  
Warner & Swasey Co., 5701 Carnegie Ave.,  
Cleveland 83, Ohio.

### CEMENT, Abrasive Disc

Delta Power Tool Div., 400 N. Lexington Ave.,  
Pittsburgh 8, Pa.  
Walls Sales Corp., 333 Nassau Ave., Brooklyn  
22, N. Y.

### CENTER-DRILLING MACHINES

Baker Brothers, Inc., 1000 Post St., Toledo 10,  
Ohio  
Hartford Special Machinery Co., 287 Homestead St., Hartford, Conn.  
Seneca Falls Mch. Co., Seneca Falls, N. Y.  
Sundstrand Mch. Tool Co., 2531 11th St.,  
Rockford, Ill.

### CENTER PUNCHES — See Machinists' Small Tools

### CENTERS, Grinding Machines, Indexing Head and Lathe

Houston Grinding & Mfg. Co., Inc., Houston 8,  
Texas  
Metal Carbides Corp., Youngstown, Ohio.  
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex,  
Detroit, Mich.  
Scully Jones & Co., 1906 Rockwell St.,  
Chicago 8, Ill.  
Wesson Co., 1220 Woodward Heights Blvd.,  
Ferndale, Mich.  
Whitman & Barnes, 40600 Plymouth Rd.,  
Plymouth, Mich.

### CERAMIC TOOL MATERIAL—See Tool Material, Ceramic

### CHAINS, Power Transmission and Conveyor

Boston Gear Works, 14 Hayward St., Quincy  
71, Mass.

### CHUCKING MACHINES, Multiple-Spindle Automatic

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.  
Bullard Co., 286 Canfield Ave., Bridgeport 6, Conn.  
Cone Automatic Mch. Co., Inc., Windsor, Vt.  
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.  
Goss & DeLeeuw Mch. Co., Kensington, Conn.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio.  
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.  
Olofsson Corp., 2729 Lyons Ave., Lansing, Mich.  
Pratt & Whitney Co., Inc., West Hartford, Conn.  
Warner & Swasey, 5701 Carnegie Ave., Cleveland 3, Ohio.

### CHUCKING MACHINES, Single-Spindle Automatic

Bullard Co., 286 Canfield Ave., Bridgeport 6, Conn.  
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.  
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
Jones & Lamson Mch. Co., Springfield, Vt.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio.  
Potter and Johnston Co., 1027 Newport Ave.,  
Providence, R. I.  
Russell Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.

### CHUCKS, Air Operated

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.  
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.  
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.  
Schradler's Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.  
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.

### CHUCKS, Collet

Bryant Chucking Grinder Co., Clinton St., Springfield, Vt.  
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.  
Cushman Chuck Co., 800 Windsor St., Hartford 2, Conn.  
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.  
Errington Mech. Lab. Inc., 24 Norwood Ave., Staten Island 4, N. Y.  
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.  
Gorton Mch. Co., Geo., 1321 Racine St., Racine, Wis.  
Hardinge Bros., Inc., 1420 College Ave., Elmhurst, N. Y.  
Jacobs Mfg. Co., West Hartford 10, Conn.  
Kearney & Trecker Corp., Milwaukee 14, Wis.  
National Acme Co., 170 E. 131st St., Cleveland 8, Ohio.  
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
Universal Engg. Co., Frankenmuth 2, Mich.  
Warner & Swasey, 5701 Carnegie Ave., Cleveland 3, Ohio.

### CHUCKS, Combination Universal-Independent

Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.  
Gisholt Mch. Co., Madison 10, Wis.  
Horton Chuck, Windsor Locks, Conn.  
Kearney & Trecker Corp., Milwaukee 14, Wis.  
National Acme Co., 170 E. 131st St., Cleveland 8, Ohio.  
Skinner Chuck Co., 95 Edgewood Ave., New Britain Conn.

### CHUCKS, Compensating

Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.  
Logansport Mch. Co., Inc., Logansport, Ind.  
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.

### CHUCKS, Diaphragm

Bryant Chucking Grinder Co., Clinton St., Springfield, Vt.  
Wadell Equip. Co., Terminal Ave., Clark, N. J.

### CHUCKS, Drill, Key Type

Delta Power Tool Div., 400 Lexington Ave., Pittsburgh 8, Pa.  
Jacobs Mfg. Co., West Hartford, Conn.

### CHUCKS, Drill, Keyless

Delta Power Tool Div., 400 Lexington Ave., Pittsburgh 8, Pa.  
Jacobs Mfg. Co., West Hartford, Conn.  
Scully-Jones & Co., 1906 Rockwell St., Chicago 8, Ill.



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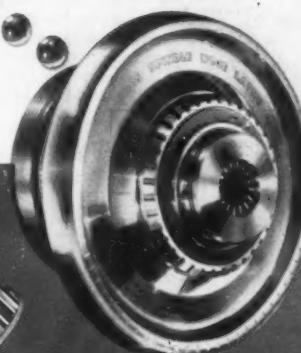
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The Jacobs Plain Bearing Chuck for drill presses, portable electric and air tools.

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Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.  
Gisholt Mch. Co., Madison 10, Wis.  
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Universal Engineering Co., Frankenmuth 2, Mich.

**CHUCKS, Gear**

Bryant Chucking Grinder Co., Clinton St., Springfield, Vt.  
Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.  
Horton Chuck, Windsor Locks, Conn.  
Le Maire Tool & Mfg. Co., Dearborn, Mich.

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Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.  
Gisholt Mch. Co., Madison 10, Wis.  
Homestrand, Inc., Larchmont, N. Y.  
Horton Chuck, Windsor Locks, Conn.  
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.

**CHUCKS, Lathes, etc.**

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.  
Bullard Co., Brewster St., Bridgeport 2, Conn.  
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.  
Gisholt Mch. Co., Madison 10, Wis.  
Horton Chuck, Windsor Locks, Conn.  
Jacobs Mfg. Co., West Hartford, Conn.  
Jones & Lamson Mch. Co., Springfield, Vt.  
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.  
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

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Brown & Sharpe Mfg. Co., Providence, R. I.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Hanchett Magna-Lock Corp., Big Rapids, Mich.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.  
Walker, O. S., Inc., Worcester, Mass.

**CHUCKS, Power Operated**

Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.  
Gisholt Mch. Co., Madison 10, Wis.  
Logansport Mch. Co., Inc., Logansport, Ind.  
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.

**CHUCKS, Quick Change and Safety**

Jacobs Mfg. Co., West Hartford 10, Conn.  
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Scully-Jones & Co., 1906 Rockwell St., Chicago 8, Ill.  
Universal Engineering Co., Frankenmuth 2, Mich.

**CHUCKS, Ring Wheel**

Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.  
Gardner Mch. Co., 414 E. Gardner St., Beloit, Wis.

**CHUCKS, Tapping**

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.  
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.  
Jacobs Mfg. Co., West Hartford, Conn.

Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.  
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.

**CHUCKS, Universal Three-Jaw**

Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.  
Delta Power Tool Div., 400 Lexington Ave., Pittsburgh 8, Pa.  
Gisholt Mch. Co., Madison 10, Wis.  
Homestrand, Inc., Larchmont, N. Y.  
Horton Chuck, Windsor Locks, Conn.  
Kearney & Trecker Corp., Milwaukee 14, Wis.  
Logansport Mch. Co., Inc., Logansport, Ind.  
Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn.  
Warner & Swasey, 5701 Carnegie Ave., Cleveland 3, Ohio.

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Gisholt Mch. Co., Madison 10, Wis.

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Cleveland Punch & Shear Works, Co., 3917 St. Clair Ave., Cleveland 14, Ohio.  
Dynamatic Div., Eaton Mfg. Co., Kenosha, Wis.  
Fawick Corp., Cleveland, Ohio.  
Minster Mch. Co., Minster, Ohio.  
Rockford Clutch Div., Rockford, Ill.

**COLLETS**—See Chucks, Collet**COMBINATION SQUARES**—See Machinists' Small Tools**COMPARATORS, Dial, Electronic and Air**

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Federal Products Corp., 1144 Eddy St., Providence, R. I.  
Hanson-Whitney Co., 169 Bartholomew Ave., Hartford 3, Conn. (dial, thread)  
Shefford Corp., Box 893, Dayton 1, Ohio.  
Starrett, L. S. Co., Athol, Mass.

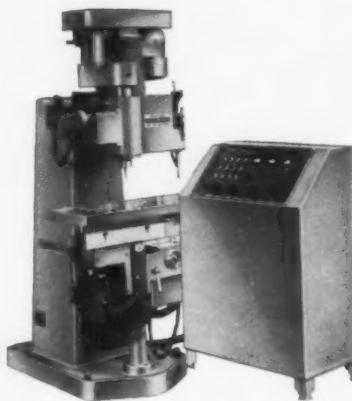
**COMPARATORS, Optical**

Bausch & Lomb Optical Co., Rochester, N. Y.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Eastman Kodak Co., Rochester, N. Y.  
Jones & Lamson Mch. Co., Springfield, Vt.  
Opto-Metric Tools, Inc., 137 Varick St., New York, N. Y.  
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

**COMPOUNDS, Cleaning**—See Cleaners, Metal**COMPOUNDS, Cutting, Grinding, Metal Drawing, etc.**—See Cutting and Grinding Fluids**COMPRESSORS, Air**

Chicago Pneumatic Tool Co., New York 17, N. Y.  
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
Wilson, K. R., Inc., Arcade, N. Y.

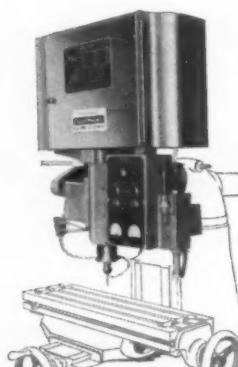
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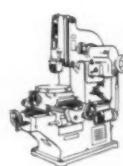
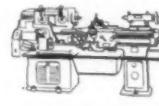
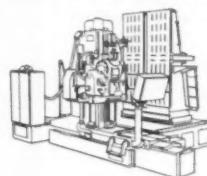
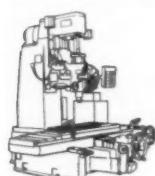
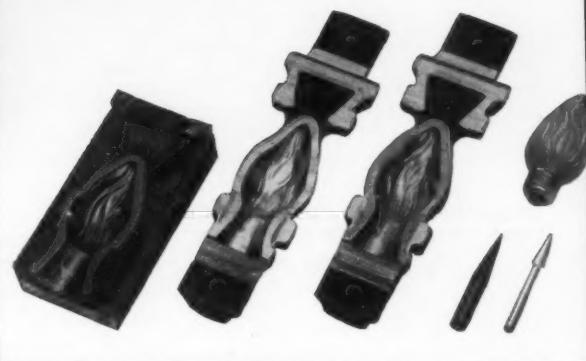
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 Eisler Engrg. Co., 750 S. 13th St., Newark 3, N. J.  
 Hartford Special Machinery Co., 287 Homestead St., Hartford, Conn.  
 Kearney & Trecker Corp., Milwaukee 14, Wis.  
 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
 National Acme Co., 170 E. 131st St., Cleveland, Ohio.  
 Van Keuren Co., Watertown, Mass.

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 Allis-Chalmers Mfg. Co., Milwaukee, Wis.  
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 Indiana Commercial Filters Corp., 28 South Ave., Lebanon, Ind.

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 Mueller Brass Co., Port Huron 35, Mich.  
 Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

### COUNTERBORES AND COUNTERSINKS

Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
 Circular Tool Co., Inc., 765 Aliens Ave., Providence 5, R. I.  
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.  
 DoAll Co., Des Plaines, Ill.  
 Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.  
 Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.  
 Heller Tool Co., Newcomerstown, Ohio.  
 National Twist Drill & Tool Co., Rochester, Mich.  
 Scully-Jones & Co., 1906 Rockwell St., Chicago 8, Ill.  
 Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.  
 Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.  
 Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mass.

### COUNTERS

Starrett, The L. S. Co., Athol, Mass.

### COUPLINGS

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
 Boston Gear Works, 14 Hayward St., Quincy 71, Mass.  
 James, D. O., Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill.  
 Mueller Brass Co., Port Huron, Mich.  
 Philadelphia Gear Works, Erie Ave., and G Sts., Philadelphia, Pa.  
 Schrader's Sons, A 470 Vanderbilt Ave., Brooklyn 38, N. Y.  
 Standard Pressed Steel Co., Jenkintown, Pa. (Shoff)  
 Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.  
 Walker Co., Inc., O. S., Rockdale St., Worcester, Mass.

**CRANES, Electric Traveling**  
 Cleveland Crane & Engrg. Co., Wickliffe, Ohio

### CUTTERS, Keyseating

Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio.  
 Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.  
 DoAll Co., Des Plaines, Ill.  
 du Mont Corp., Greenfield, Mass.  
 Mitts & Merrill, 1009 So. Water St., Saginaw, Mich.  
 National Twist Drill Co., Rochester, Mich.  
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

### CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 235 Canal St., Shelton, Conn.  
 Barber-Colman Co., 1300 Rock St., Rockford, Ill.  
 Brown & Sharpe Mfg. Co., Providence, R. I.  
 Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill. (End mills)  
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.  
 DoAll Co., Des Plaines, Ill.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Gorton, George, Mich. Co., 1321 Racine St., Racine, Wis.  
 Hanson-Whitney Co., 169 Bartholomew Ave., Hartford 3, Conn. (dial, thread)  
 Haynes Stellite Co., Kokomo, Ind.  
 Ingersoll Milling Mach. Co., 2442 Douglas St., Rockford, Ill.  
 Kearney & Trecker Corp., Milwaukee, Wis.  
 Kennametal, Inc., Latrobe, Pa.  
 Lovejoy Tool Co., Inc., Springfield, Vt.  
 Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
 National Twist Drill & Ti. Co., Rochester, Mich.  
 Onsrud Machine Works, Inc., Niles, Ill.  
 Tomkins-Johnson Co., Jackson, Mich.  
 Vascovay-Ramet Corp., Waukegan, Ill.  
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.



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... one of Bryant's internal grinding experts in the New York area. Like other Bryant representatives he knows grinding problems from "A to Z" and likes to solve them.



### CUTTING AND GRINDING FLUIDS

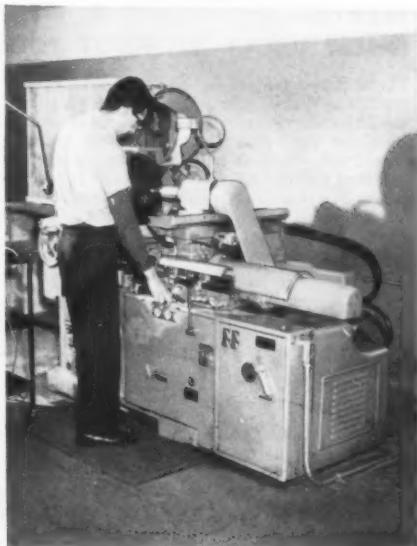
Cincinnati Milling Products Div., Cincinnati, Ohio  
 Cincinnati Milling and Grinding Mch., Inc., Cincinnati 9, Ohio  
 Cities Service Oil Co., 70 Pine St., New York, N. Y.  
 DoAll Co., Des Plaines, Ill.  
 Oakite Products, Inc., 26 Rector St., New York 6, N. Y.  
 Shell Oil Co., 50 W. 50th St., New York, N. Y.  
 Sinclair Refining Co., 600 Fifth Ave., New York, N. Y.  
 Stuart, D. A. Oil Co. Ltd., 2727 S. Troy St., Chicago 23, Ill.  
 Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.  
 Texas Co., 135 E. 42nd St., New York, N. Y.

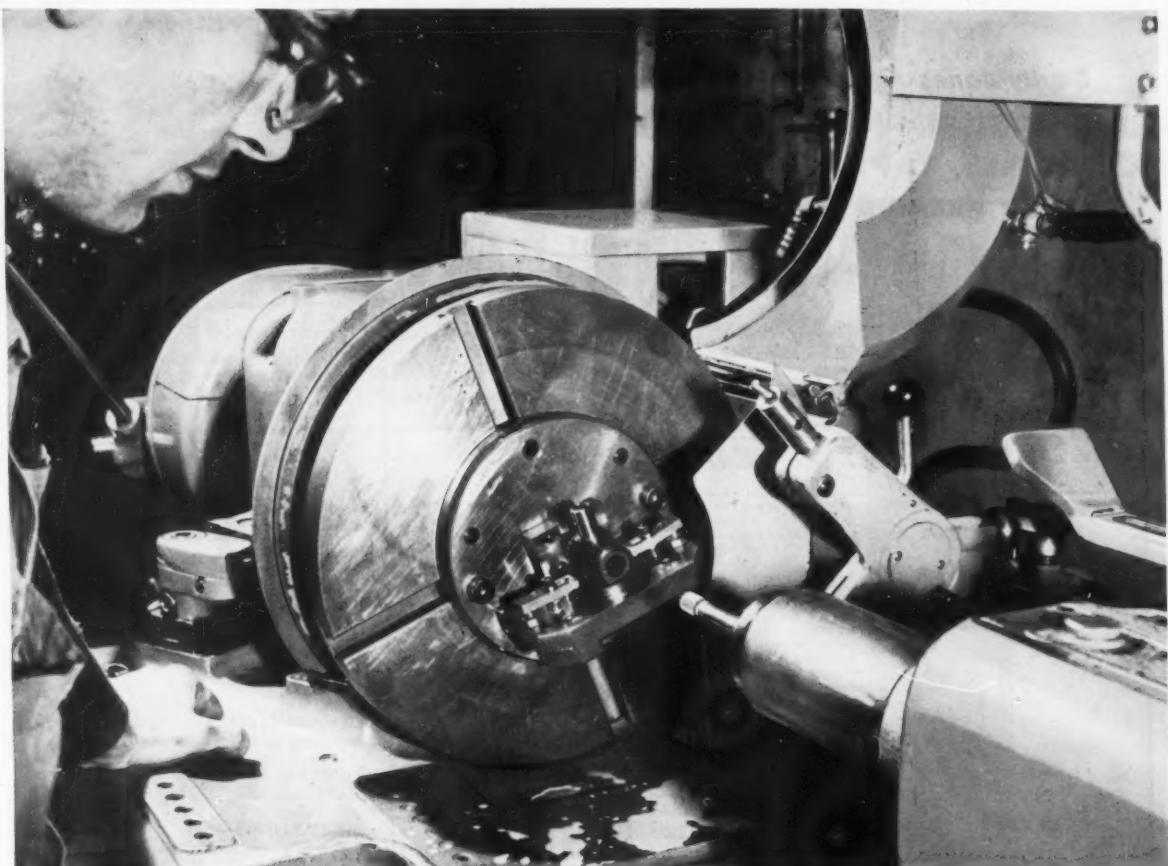
### CUTTING-OFF MACHINES, Lathe Type

Bardons & Oliver, Inc., 1133 West Ninth St., Cleveland 13, Ohio  
 Brown & Sharpe Mfg. Co., Providence, R. I.  
 Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio  
 Cone Automatic Mach. Co., Windsor, Vt.  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Modern Machine Tool Co., Jackson, Mich.

### CUTTING-OFF SAWS, Abrasive Wheel

Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh, Pa.  
 DoAll Co., Des Plaines, Ill.  
 Norton Co., 1 New Bond St., Worcester 6, Mass.  
 Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 35, Pa.  
 Wallace Supplies Mfg. Co., 1308 Diversay Parkway, Chicago 14, Ill.





## "Everything they claimed and then some..."



That's Mr. Gerald H. Buchholz talking. He's owner and manager of the Federal Tool and Instrument Company, Corona, New York, and he's talking about his No. 1116 Bryant Internal Grinder.

For more than two years now, Federal has been turning out close-tolerance work with a Bryant Grinder. Mr. Buchholz leaves no doubt as to its value: "It saves us both time and labor, and it holds tolerances better than any similar machine.

"Before our purchase of the 1116 we used an attachment on another machine for our fine work. But it was too slow for our production. We got the Bryant with an eye toward new business — and we got it!

"This machine has been everything the Bryant people claimed and then some. A man can ask no more than that."

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Internal Grinders • Internal & External Thread Gages • Granite Surface Plates • Magnetic Drums for Computers • Special Machinery

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MACHINERY, September, 1957—309

**Scully-Jones Adjustable Adapters  
FOR PREMIUM PERFORMANCE  
OF DRILLS, TAPS, REAMERS  
AT NO PREMIUM IN PRICE!**

| These benefits . . .        | for these reasons . . .                 | result from these PREMIUM features  |
|-----------------------------|---|---|
| <b>INCREASED ACCURACY</b>   | No "cocking" or spindle distortion      | 1. Top face of quick-lock nut is square with threads.   |
|                             | Cutting tools run true                  | 2. Locking shoe assures even distribution of pressure on all mating threads.                          |
| <b>INCREASED PRODUCTION</b> | Faster adjustment                       | 3. Bore and shank are concentric within .002 in. gaged 6 in. from adapter.                            |
|                             | Faster tool changes                     | 4. Quick-lock nut locks any place on thread by only $\frac{1}{4}$ turn of set screw.                  |
|                             | Full use of adjustable range of adapter | 5. Pilot nose eliminates "binding."   |
| <b>LOWER TOOL COSTS</b>     | Reduced tool breakage                   | 6. Keyhole-type drift slot simplifies tool ejection.  |
|                             | Adapter lasts longer                    | 7. New Lock-and-Eject type eliminates use of conventional drift.                                      |
|                             | Solve pull-out problems                 | 8. Quick-lock nut is thinner than nuts used on most adapters.   |
|                             |   | 9. Small diameter permits use on close centers.   |
|                             |   | 10. Keyhole-type drift slot eliminates need for hammering with conventional drift.                    |
|                             |   | 11. Friction-type nut prevents thread damage. Set screw does not contact threads.                     |
|                             |   | 12. "Stressproof" steel induction hardened to give best combination of wear resistance and toughness. |
|                             |   | 13. New Lock-and-Eject type increases holding power.  |

Call your Scully-Jones factory-trained representative or distributor for complete information and prices.

**PRECISION HOLDING TOOLS**  
"Precision Holding" for holding precision

Scully-Jones and Company, 1906 South Rockwell Street, Chicago 8, Illinois

**for profit-minded tool buyers!**



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Give you rigidity and concentricity needed for accurate work, longer life.



LIVE CENTERS

Take shock and abuse of heavy loads turning at high speeds.



"SCULLY-DRIFT" TOOL EJECTORS

Speed tool changes . . . protect tools, spindles, and bearings. Twist-of-the-wrist ejects tool or holder.



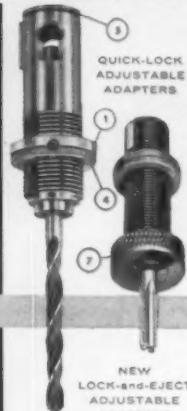
CENTER DRILL DRIVERS

Offset splined section gives positive drive in drill flutes and protects cutting edges.

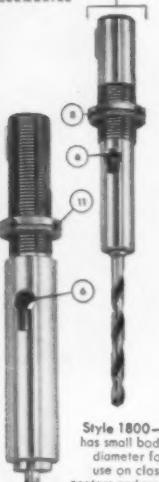


DRILL STOPS

Make control of drill depth simpler, more accurate. Sleeve snaps out for fast tool change.



SPINDLE EXTENSION ASSEMBLIES



Style 1800—has small body diameter for use on close centers and next to shoulders.

Style 1900—has larger body diameter and inside taper.

**CUTTING TOOLS**—See Tool Material

**CYLINDERS, Air**

Cushman Chuck Co., 806 Windsor St., Hartford 2, Conn.  
Hannifin Corp., 501 Wolf Rd., Des Plaines, Ill.  
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio  
Logansport Mch. Co., Inc., Logansport, Ind.  
Thompson Products, Inc., Warren, Mich.  
Tomkins-Johnson Co., Jackson, Mich.

**CYLINDERS, Hydraulic**

Barnes, John S., Corp., 301 S. Water St., Rockford, Ill.  
Chicago Pneumatic Tool Co., New York 17, N. Y.  
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.  
Hydraulic Press Mfg. Co., Mt. Gilead, Ohio  
Logansport Machine Co., Inc., Logansport, Ind.  
Olliger Co., 1569 W. Pierce St., Milwaukee 16, Wis.  
Thompson Products, Inc., Warren, Mich.  
Vickers, Inc., Detroit 32, Mich.  
Wilson, K. R., Inc., Arcade, N. Y.

**DEBURRING MACHINES**

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.  
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.  
Modern Industrial Eng. Co., 14230 Birwood Ave., Detroit 38, Mich.  
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio  
Sheffield Corp., Box 893, Dayton 1, Ohio  
Wallace Supplies Mfg. Co., 1308 Diversey Park-way, Chicago 14, Ill.

**DEMAGNETIZERS**

Blanchard Mch. Co., 64 State St., Cambridge Mass.  
Lufkin Rule Co., Saginaw, Mich.

**DIE CASTINGS**—See Casting, Die

**DIE CASTING MACHINES**

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.

**DIE CUSHIONS**

Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
Clearing Mch. Corp., 6499 W. 65th St., Chicago, Ill.  
Danly Mch. Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
Dayton Rogers Mfg. Co., Minneapolis, Minn.  
Federal Machine & Welder Co., Overland Ave., Warren, Ohio  
Minster Mch. Co., Minster, Ohio  
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.

**DIEING MACHINES**

Pratt & Whitney Co., Inc., West Hartford, Conn.

**DIE INSERTS, Carbide**

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Kennametal Inc., Latrobe, Pa.  
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
Vascoley-Ramet Corp., Waukegan, Ill.

**DIE SETS AND DIEMAKERS' SUPPLIES**

Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
Danly Mch. Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
Products Mch. Co., 985 Housatonic Ave., Bridgeport 1, Conn.  
U. S. Tool Co., Inc., 255 North 18th St., Amherst, N. J.  
Wales-Strippit Co., Akron, N. Y.

# 39<sup>th</sup> National Metal Exposition

Thousands of products will be displayed by more than 500 metalworking firms in the vast exhibit areas of Chicago's International Amphitheatre and Exposition Hall, Monday through Friday, November 4 to 8. 50,000 experts from the United States and the free world will meet with you.

## 2<sup>nd</sup> World Metallurgical Congress

Years of intensive effort have gone into this world event. Overseas scientists and engineers will attend from 38 countries of the free world. They will exchange ideas with you, present their own technical and practical papers.

You will want to be in Chicago the week of November 4.

You will want to hear these scientists and engineers from the whole, wide wonderful world of metals . . . outstanding metal men from the United States, Canada and the entire free world . . . more than 38 countries will be represented. You will want to listen, to discuss, to meet the men who are creating this world of metals.

You will want to be in Chicago to see the vast array of metalworking products and equipment that will be displayed by more than 500 leading firms at the Metal Show — the 39th National Metal Exposition — in the International Amphitheatre and Exposition Hall. This will be the greatest display of metals and metalworking equipment. Here, in one week, you will see more products, talk with more metalworking experts, than in a year of travel.



### Exhibit Space Available

Hundreds of manufacturers have reserved Metal Show space, but there are good locations still available in the vast new exposition halls of the International Amphitheatre. If the metalproducing or metalworking industries are your market, don't miss this show — write for display information now.



You will want to be in Chicago with your associates from management, engineering, production and sales. This will be a world event you will long remember — and from which you will obtain ideas and knowledge to meet the metalworking problems of today and tomorrow. Make a date now — to be in Chicago, the week of November 4. For hotel reservations write: Metal Show Housing Bureau, c/o Chicago Convention Bureau, Inc. 134 N. LaSalle Street, Suite 900, Chicago 2, Illinois.

*Cooperating Societies: Metals Division, American Institute of Mining, Metallurgical and Petroleum Engineers . . . the Society for Non Destructive Testing . . . the Industrial Heating Equipment Association.*

**AMERICAN SOCIETY FOR METALS**  
*The Engineering Society for the Metal Industry*

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Cleveland 3, Ohio

**DIE SINKING MACHINES**—See Milling Machines, Die Sinking, etc.

**DIE STOCKS**—See Stocks and Dies

**DIES, Blanking, Forming, Drawing, Extruding, etc.**

Bath, Cyril Co., 32324 Aurora Road, Solon, Ohio  
Cincinnati Shaper Co., Hopple & Garrard, Cincinnati, Ohio  
Dreis & Krump Mfg. Co., 7400 Loomis Blvd., Chicago 36, Ill.  
Ferracute Mch. Co., Bridgeton, N. J.  
Metal Carbides Corp., Youngstown, Ohio  
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.

Moore Special Tool Co., Inc., 740 Union Ave., Bridgeport 7, Conn.  
Niagara Mch. & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
Olofsson Corp., Lansing, Mich.  
Ryerson & Son, Inc., Jos. T., 16th & Rockwell Sts., Chicago 8, Ill.  
Vascoloy-Ramet Corp., Waukegan, Ill.  
Verson Allsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, Ill.  
Wales-Strippit Corp., North Tonawanda, N. Y.

**DIES, Lettering and Embossing**

Wales-Strippit Corp., North Tonawanda, N. Y.  
**DIES, Self-opening Threading**  
Consolidated Mch. Tool Div., 565 Blossom Rd., Rochester 10, N. Y.  
Eastern Mch. Screw Corp., New Haven, Conn.  
Greenfield Tap & Die Corp., Greenfield, Mass.

Jones & Lamson Mch. Co., Springfield, Vt.  
Landis Mch. Co., Waynesboro, Pa.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio

**DIES, Thread Cutting**—See Stocks and Dies

**DIES, Thread Rolling**

Landis Machine Co., Waynesboro, Pa.  
National Acme Co., 170 E. 131st St., Cleveland 8, Ohio  
Pratt & Whitney Co., Inc., West Hartford, Conn.  
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.

**DISINTEGRATORS**

Cincinnati Milling and Grinding Mch., Inc., Cincinnati 9, Ohio  
Electro-Spark Co., Inc., 23 E. 26th St., New York 10, N. Y.  
Elox Corp., Royal Oak 3, Mich.

**DIVIDERS AND TRAMMELS**—See Layout and Drafting Tools

**DIVIDING HEADS**—See Indexing and Spacing Equipment

**DOWEL PINS**

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.  
Danly Mch. Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
DoAll Co., Des Plaines, Ill.  
Productive Machine Co., 985 Housatonic Ave., Bridgeport, Conn.  
Standard Pressed Steel Co., Jenkintown, Pa.  
U. S. Tool Co., Inc., 255 North 18th St., Amherst, N. J.

**DRAWING COMPOUNDS**

Oakite Products, Inc., 26 Rector St., New York 6  
Stuart, D. A. Oil Co. Ltd., 2727 S. Troy St., Chicago 23, Ill.

**DRESSERS, Grinding Wheel**

Colonial Broach & Machine Co., P. O. Box 37, Harper St., Detroit 13, Mich.  
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio  
Hoglund Eng. & Mfg. Co., Inc., Berkeley Hts., N. J.  
Metal Carbides Corp., Youngstown, Ohio  
Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.  
Norton Co., 1 New Bond St., Worcester, Mass.  
Pratt & Whitney Co., Inc., West Hartford, Conn.  
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio

**DRIFT KEYS**

Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
DoAll Co., Des Plaines, Ill.  
Scully-Jones & Co., 1906 S. Rockwell St., Chicago 8, Ill.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

**DRILL HEADS, Multiple Spindle**

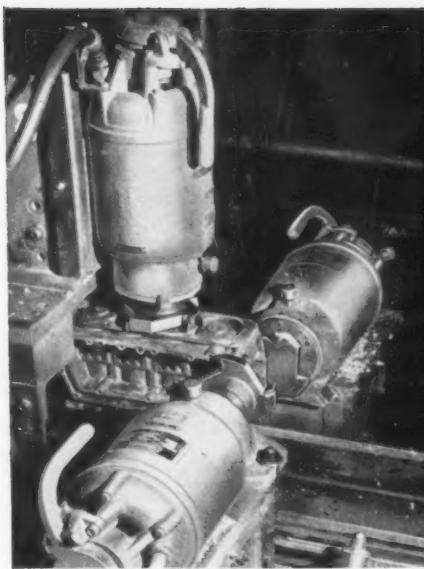
Atlas Press Co., 20108 N. Pitcher, Kalamazoo, Mich.  
Avey Drilling Machine Co., 25 East Third St., Covington, Ky.  
Bader Brothers, Inc., 1000 Post St., Toledo 10, Ohio  
Barres Drill Co., 814 Chestnut, Rockford, Ill.  
Baugh Machine Tool Co., 15 Watson Ave., Springfield, Mass.  
Buffalo Forge Co., Broadway, Buffalo, N. Y.  
Cross Co., 3250 Bellevue, Detroit 7, Mich.  
(Continued on page 314)

#### WRITE FOR CATALOG

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Also, 20 to 100 ton Double Crank, High Speed, Straight Side Presses.

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MILL UP TO **3** SIDES AT ONE TIME  
WITH  
**Onsrud**<sup>®</sup>  
A-242S  
**TRI-WAY MILLING MACHINE**  
A member of the COMPLETE family of Onsrud Milling Machines  
designed specifically for Aluminum and related nonferrous milling.

**PROOF** of the tremendous productivity of Onsrud milling machines designed for nonferrous milling is shown by this production study. This kind of production is typical of the advantages that can be yours with every

Onsrud milling machine.



**THE PART:** Outboard motor cylinder block, aluminum alloy casting 7" wide x 13" long and 6" high.

**THE MACHINE:** Onsrud A-242S Tri-Way Milling Machine with one vertical and two horizontal opposed milling heads.

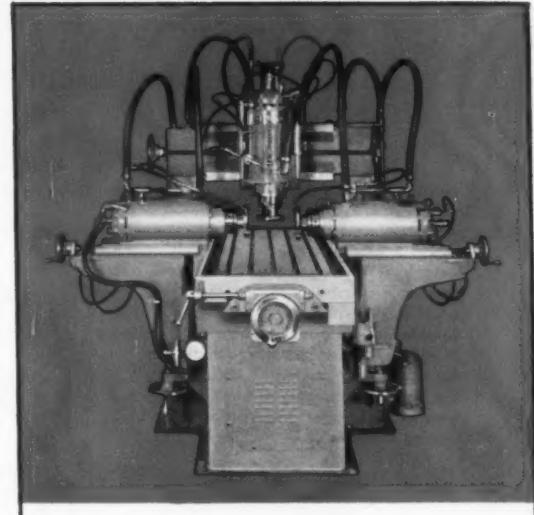
**OPERATION:** Machine three sides of block in one set-up and in one pass.

**ACCURACY:** Flatness tolerance  $\pm 0.0003"$ .  
Parallel tolerance  $\pm 0.001"$ .

**PRODUCTION:** Three parts per minute.

**CUTTER LIFE:** 500 to 1,000 parts per regrind.

Onsrud high speed milling production is only possible because Onsrud machines are designed and built specifically for milling aluminum and related nonferrous metals. The cutter speeds and feeds are exactly right to give smooth finish and precision . . . at super-high production speeds.



Onsrud A-242S Tri-Way Milling Machine, for milling up to three sides at one time, of any part square or rectangular in cross section. Planer type table with variable feed up to 258 IPM. Cutter motors Onsrud 10 HP, 3,600 RPM, liquid cooled.



Let us give you complete data on the Onsrud A-242S Tri-Way Milling Machine...and all other Onsrud milling machines for nonferrous metal milling. Get the facts on these proved, high speed production machines. Your inquiry is cordially invited.

**ONSRUD**  
**MACHINE WORKS, INC.**  
machine tool division

7716 Lehigh Avenue  
Niles 31, Illinois  
(SUBURB OF CHICAGO)



HIGH SPEED MILLING MACHINES FOR ALUMINUM AND RELATED NONFERROUS METAL MILLING

For doing things *better* by doing things *differently!*

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 Etco Tool Co., Inc., 594 Johnson Ave., Brooklyn, N. Y.  
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
 Kearney & Trecker Corp., Milwaukee 14, Wis.  
 Leland Gifford Co., Box 989, Worcester 1, Mass.

National Automatic Tool Co., Richmond, Ind.  
 Snyder Tool & Engg. Co., 3400 Lafayette, Detroit 7, Mich.

Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

United States Drill Head Co., 616 Burns, Cincinnati, Ohio

#### DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
 Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.  
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
 Kingsbury Mch. Tool Corp., Keene, N. H.  
 Millholland, W. K. Machinery Co., 6403 Westfield Blvd., Indianapolis 5, Ind.  
 Rehnberg-Jacobson Mfg. Co., 2135 Kiswaukee St., Rockford, Ill.  
 Snow Manufacturing Co., Bellwood, Illinois

#### DRILL SLEEVES AND EXTENSION HOLDERS

Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio

DoAll Co., Des Plaines, Ill.  
 Greenfield Tap & Die Corp., Greenfield, Mass.  
 National Automatic Tool Co., Richmond, Ind.  
 National Twist & Tool Co., Rochester, Mich.  
 Scully-Jones & Co., 1906 S. Rockwell St., Chicago 8, Ill.

#### DRILLING AND BORING UNITS, Self-contained

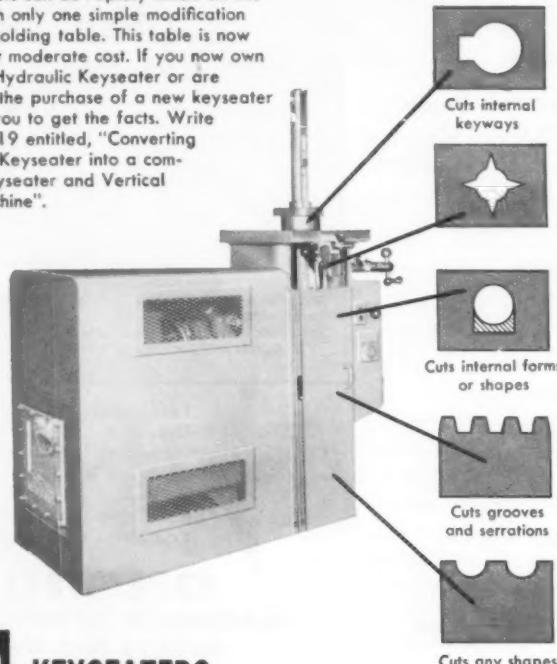
Avey Drilling Machine Co., 25 East Third St., Covington, Ky.  
 Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio  
 Barnes, W. F. & John Co., Rockford, Ill.  
 Baush Machine Tool Co., 15 Watson Ave., Springfield, Mass.  
 Buhr Machine Tool Co., 839 Green St., Ann Arbor, Mich.  
 Cross Co., 3250 Bellevue, Detroit 7, Mich.  
 Etco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y.  
 Govro-Nelson Co., 1831 Antoinette St., Detroit 8, Mich.  
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
 Homestrand, Inc., Larchmont, N. Y.  
 Kaukauna Machine & Foundry Div., Giddings & Lewis Machine Tool Co., Kaukauna, Wis.  
 Kearney & Trecker Corp., Milwaukee 14, Wis.  
 LaSalle Tool, Inc., 3840 E. Outer Dr., Detroit 34, Mich.  
 Leland-Gifford Co., Box 989, Worcester 1, Mass.  
 National Automatic Tool Co., S. 7th and N. Sts., Richmond, Ind.  
 Russell Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.  
 Sheffield Corp., Box 893, Dayton 1, Ohio  
 Snyder Tool & Engg. Co., 3400 E. Lafayette, Detroit, Mich.  
 Townsend, H. P. Mfg. Co., Elmwood, Conn.  
 Western Machine Tool Works, Holland, Mich.

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### KEYSEATER AND VERTICAL CUTTING MACHINE

Simple modification greatly increases productive capacity of this versatile machine.

An M & M Hydraulic Keyseater is not only a keyseater that cuts internal keyways up to 5" wide but a vertical cutting machine as well. Serrations, grooves, teeth—a wide variety of cuts can be rapidly made on this machine with only one simple modification — a work-holding table. This table is now available at moderate cost. If you now own an M & M Hydraulic Keyseater or are considering the purchase of a new keyseater it will pay you to get the facts. Write for Bulletin 19 entitled, "Converting the M & M Keyseater into a combination Keyseater and Vertical Cutting Machine".



## M&M KEYSEATERS AND VERTICAL CUTTING MACHINES

MITTS & MERRILL • 64 Holden Street • SAGINAW, MICHIGAN

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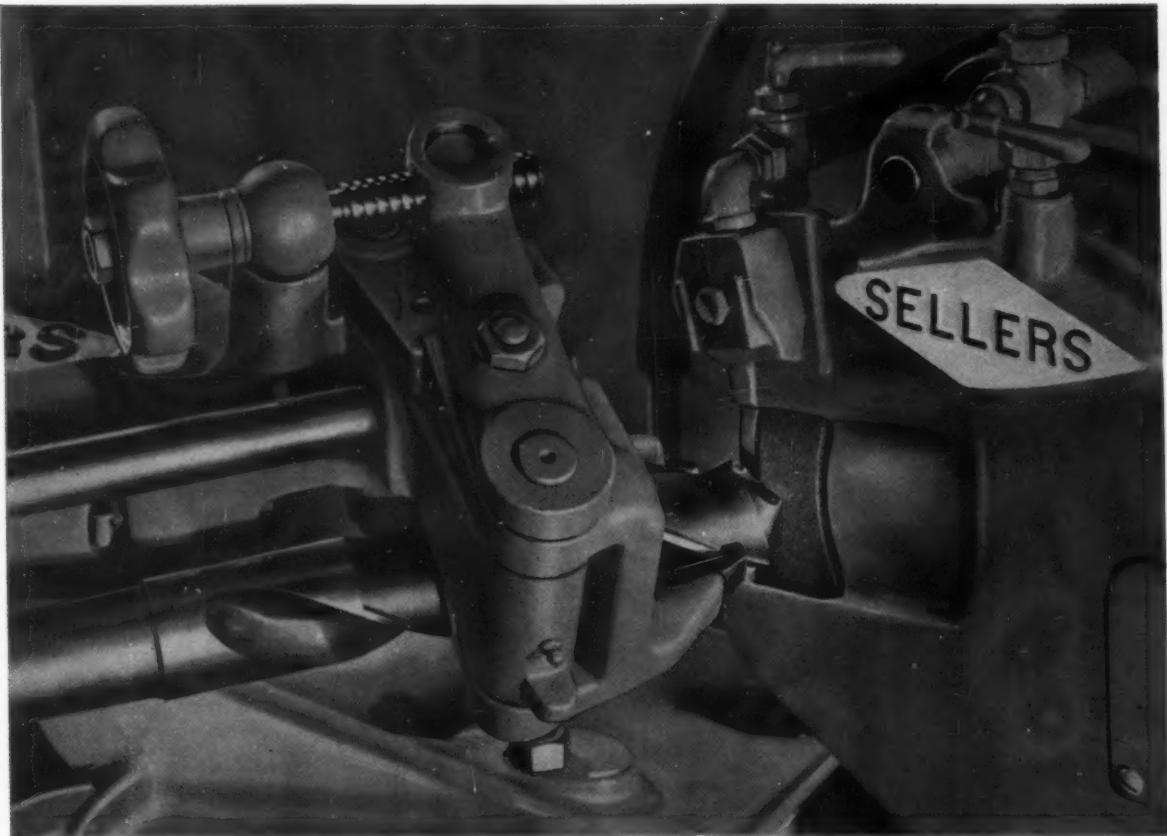
#### DRILLING MACHINES, Automatic

Avey Drilling Machine Co., 25 East Third St., Covington, Ky.  
 Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio  
 Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
 Barnes, W. F. & John Co., Rockford, Ill.  
 Baush Machine Tool Co., 15 Watson Ave., Springfield, Mass.  
 Bedine Corp., 317 Mt. Grove St., Bridgeport 5, Conn.  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Cross Co., 3250 Bellevue, Detroit 7, Mich.  
 Davis & Thompson Co., 4460 N. 124th St., Milwaukee 10, Wis.  
 Edlund Mchry. Co. Div., Cortland, N. Y.  
 Etco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y.  
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
 Kearney & Trecker Corp., Milwaukee 14, Wis.  
 Kingsbury Mch. Tool Corp., Keene, N. H.  
 LaSalle Tool, Inc., 3840 E. Outer Dr., Detroit 34, Mich.  
 Leland-Gifford Co., Box 989, Worcester 1, Mass.  
 Le Maire Tool & Mfg. Co., Dearborn, Mich.  
 Modern Industrial Eng. Co., 14230 Birwood Ave., Detroit 38, Mich.  
 Moline Tool Co., Moline, Ill.  
 National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
 Olofsson Corp., Lansing, Mich.  
 Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.  
 Snow Manufacturing Co., Bellwood, Ill.  
 Townsend H. P. Mfg. Co., Elmwood, Conn.  
 Wales-Strippit Corp., Akron, N. Y.

#### DRILLING MACHINES, Bench

Atlas Press Co., 20108 N. Pitcher, Kalamazoo, Mich.  
 Avey Drilling Machine Co., 25 East Third St., Covington, Ky.  
 Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
 Cincinnati Lathe & Tool Co., Marburg Ave., Cincinnati 9, Ohio  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.

(Continued on page 316)



## Sellers grinder produces scientifically correct drill point *quickly, easily, economically!*

Here's drill-point grinding that can actually lift the performance level of all the drilling equipment in your shop — it's that much better.

The Sellers machine grinds one lip completely and then, with every condition the same, grinds the second lip after rotating the drill in the chuck 180 degrees. The drill is held so that, regardless of eccentricity in the drill or wear in the chuck, the point is exactly on center. When the drill alone is revolved 180 degrees in order to grind both lips, there is no chance of any machine error creeping into the result. What's more, the chisel point has great compression strength and fine heat-conducting qualities.

The point generated is scientifically correct, with the lip clearance

increasing proportionately from the periphery to the chisel point. This means drill points cut faster, longer . . . drill through more inches of metal per grind and produce holes that are true cylinders of accurate size.

During grinding the chuck is rotated, sweeping the axis of the drill through the necessary arc. At the same time, the drill lip can be moved back and forth across the face of the wheel by a lever-actuated slide. This traverse motion permits very rapid removal of metal.

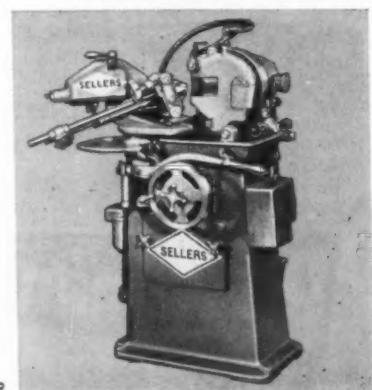
The Sellers machine is fast and simple to operate. So much so, that an unskilled operator can produce more drills than an experienced hand grinder.

For more information about this unique machine, send for a copy of Bulletin 4201.

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## Product Directory

Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh, Pa.  
 Edlund Machinery Co. Div., Cortland, N. Y.  
 Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio  
 Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio  
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
 Henry & Wright Div., Hartford, Conn.  
 Leland-Gifford Co., Box 989, Worcester, Mass.  
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

### **DRILLING MACHINES, Deep Hole**

Avey Drilling Machine Co., 25 East Third St., Covington, Ky.  
 Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio  
 Baush Machine Tool Co., 15 Wason Ave., Springfield, Mass.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
 Leland-Gifford Co., Box 989, Worcester 1, Mass.  
 National Automatic Tool Co., Inc., S. 7th and N. St., Richmond, Ind.  
 Pratt & Whitney Co., Inc., West Hartford, Conn.  
 Wales-Strippit Corp., Akron, N. Y.

### **DRILLING MACHINES, Gang, Multiple-spindle**

Avey Drilling Machine Co., 25 East Third St., Covington, Ky.  
 Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio  
 Barnes Drill Co., 814 Chestnut, Rockford, Ill.

Barnes, W. F. & John Co., Rockford, Ill.  
 Baush Machine Tool Co., 15 Watson Ave., Springfield, Mass.  
 Bodine Corp., 317 Mt. Grove St., Bridgeport 5, Conn.  
 Cincinnati Bickford Div., Oakley, Cincinnati, Ohio  
 Cleereman Machine Tool Co., Green Bay, Wis.  
 Consolidated Mch. Tool Corp., Rochester, N. Y.  
 Davis & Thompson Co., 4460 124th St., Milwaukee 10, Wis.  
 Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh, Pa.  
 Edlund Machinery Co. Div., Cortland, N. Y.  
 Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio  
 Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio  
 Greenlee Bros. & Co., 2136 12th St., Rockford, Ill.  
 Hamilton Tool Co., 834 So. 9th St., Hamilton, Ohio  
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
 Henry & Wright Div., Hartford, Conn.  
 Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
 Leland-Gifford Co., Box 989, Worcester, Mass.  
 LeMaire Tool & Mfg. Co., Dearborn, Mich.  
 Modern Industrial Eng. Co., 14230 Birwood Ave., Detroit 38, Mich.  
 Moline Tool Co., Moline, Ill.  
 National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
 Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
 South Bend Lathe Works, South Bend 22, Ind.  
 Western Machine Tool Works, Holland, Mich.

Carlton Mch. Tool Co., 2961 Meeker St., Cincinnati 25, Ohio  
 Cincinnati Bickford Div., Oakley, Cincinnati, Ohio  
 Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio  
 Cincinnati Lathe & Tool Co., Marburg Ave., Cincinnati 9, Ohio  
 Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., Cleveland 14, Ohio  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio  
 Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio  
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
 Onsrud Machine Works, Inc., Niles, Ill.  
 Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.  
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 Avey Drilling Machine Co., 25 East Third St., Covington, Ky.  
 Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio  
 Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
 Cincinnati Bickford Div., Oakley, Cincinnati, Ohio  
 Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh, Pa.  
 Edlund Machinery Co. Div., Cortland, N. Y.  
 Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio  
 Fosdick Mch. Tool Co., 1638 Blue Rock St., Cincinnati 23, Ohio  
 Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio  
 Henry & Wright Div., Hartford, Conn.  
 Leland-Gifford Co., Box 989, Worcester, Mass.  
 Lewis & Son, Inc., Louis, 3610 So. Broadway, Los Angeles, Calif.  
 National Automatic Tool Co., Inc., S. 7th and N. St., Richmond, Ind.  
 Snow Manufacturing Co., Bellwood, Illinois  
 South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
 Townsend, H. P., Mfg. Co., Elmwood, Conn.  
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 Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio  
 Barnes, W. F. & John Co., Rockford, Ill.  
 Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.  
 Canton Tool Mfg. Co., E. Canton, Ohio.  
 Cincinnati Bickford Div., Oakley, Cincinnati, Ohio  
 Cincinnati Lathe & Tool Co., Marburg Ave., Cincinnati 9, Ohio  
 Cleereman Machine Tool Co., Green Bay, Wis.  
 Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
 Etco Tool Co., Inc., 594 Johnson Ave., Brooklyn 37, N. Y.  
 Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio  
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.

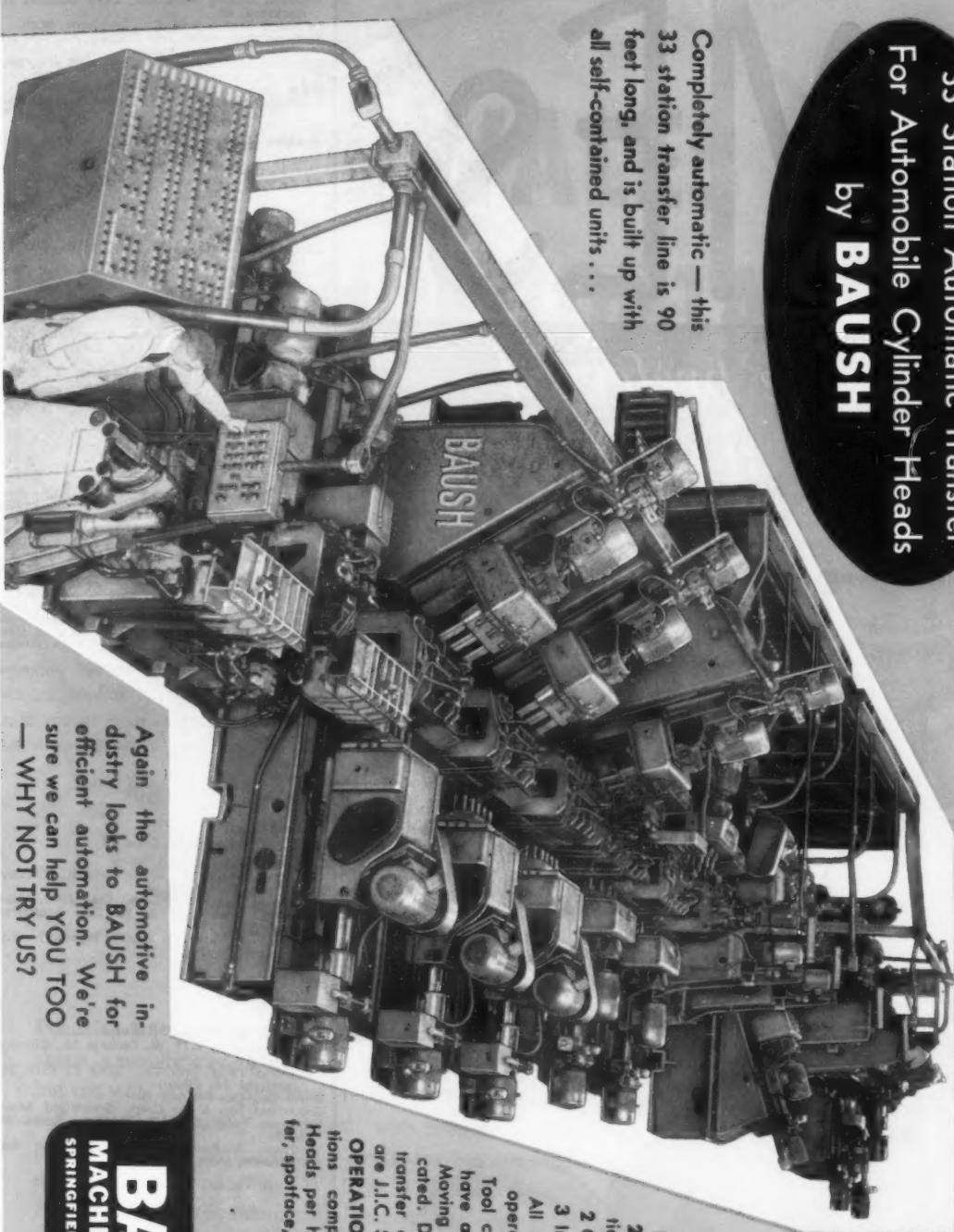
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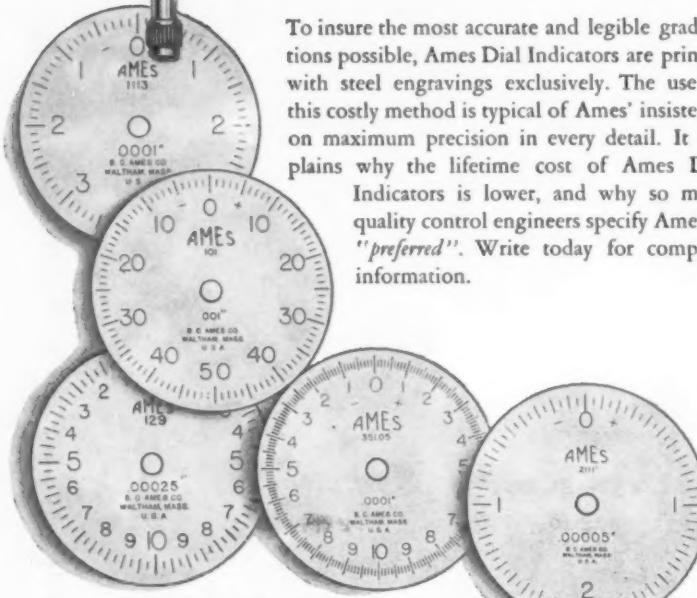
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South Bend Lathe Works, Inc., 425 E. Madison  
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Western Machine Tool Works, Holland, Mich.

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Circular Tool Co., Inc., 765 Allens Ave., Providence  
5, R. I.  
Cleveland Twist Drill Co., 1242 E. 49th St.,  
Cleveland, Ohio  
DoAll Co., Des Plaines, Ill.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
National Twist Drill & Tool Co., Rochester,  
Mich.  
Threadwell Tap & Die Co., 16 Arch St., Green-  
field, Mass.  
Whitman & Barnes, 40600 Plymouth Rd.,  
Plymouth, Mich.

#### DRILLS, Core

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Chicago-Latrobe, 411 W. Ontario St., Chicago  
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Cleveland Twist Drill Co., 1242 E. 49th St.,  
Cleveland 14, Ohio  
DoAll Co., Des Plaines, Ill.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit  
32, Mich.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Metallurgical Products Dept. of General Electric  
Co., Box 237, Roosevelt Park Annex,  
Detroit 32, Mich.  
National Twist Drill & Ti. Co., Rochester,  
Mich.  
Scully-Jones & Co., 1906 Rockwell St., Chi-  
cago 8, Ill.  
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Ferndale, Mich.  
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#### DRILLS, Deep Hole, Gun

Ace Drill Corp., Adrian, Mich.  
Chicago-Latrobe, 411 W. Ontario St., Chicago  
10, Ill.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
National Twist Drill & Ti. Co., Rochester,  
Mich.  
Whitman & Barnes, 40600 Plymouth Rd.,  
Plymouth, Mich.

#### DRILLS, Oil Hole, Oil Tube

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10, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St.,  
Cleveland 14, Ohio  
DoAll Co., Des Plaines, Ill.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
National Twist Drill & Ti. Co., Rochester,  
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Whitman & Barnes, 40600 Plymouth Rd.,  
Plymouth, Mich.

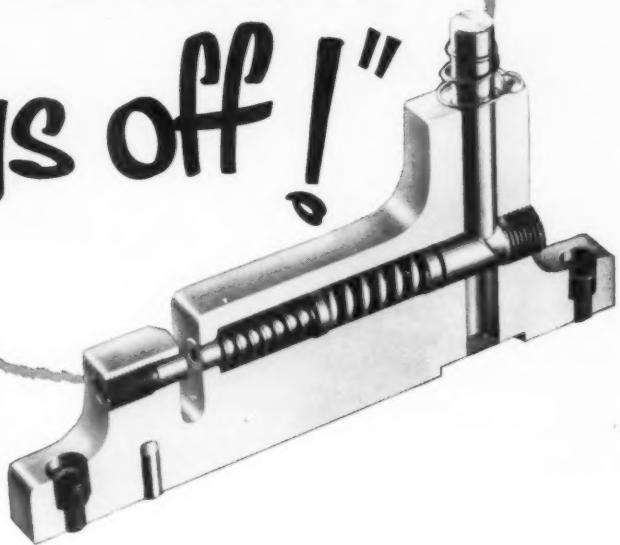
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Ingersoll-Rand Co., 11 Broadway, New York  
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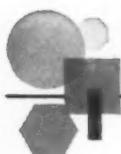
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Greenfield Tap & Die Corp., Greenfield, Mass.  
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Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

#### DRILLS, Subland

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DoAll Co., Des Plaines, Ill.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
National Twist Drill & Tool Co., Rochester, Mich.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

#### DRILLS, Twist, High-Speed Steel, Carbon Steel

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Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
Cleveland Twist Drill Co., 1242 49th St., Cleveland 14, Ohio  
DoAll Co., Des Plaines, Ill.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
National Twist Drill & Tool Co., Rochester, Mich.  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.  
Threadwell Tap & Die Co., 16 Arch, Greenfield, Mass.  
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#### DRILLS, Twist, Carbide, Carbide-tipped

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Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh 22, Pa.  
Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio  
DoAll Co., Des Plaines, Ill.  
Heller Tool Co., Newcomerstown, Pa.  
National Twist Drill & Tool Co., Rochester, Mich.  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.  
Threadwell Tap & Die Co., 16 Arch St., Greenfield, Mass.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

#### DRILLS, Wire

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Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
Cleveland Twist Drill Co., Cleveland, O.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
National Twist Drill & Tool Co., Rochester, Mich.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

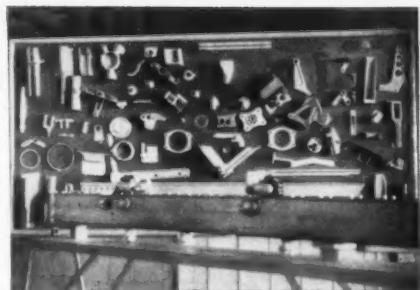
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Tracing Attachments**

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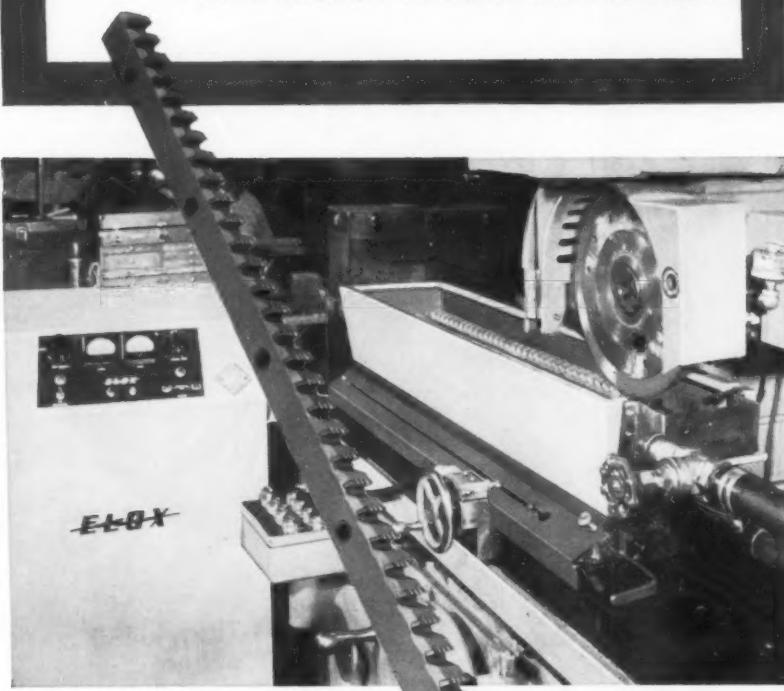
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Conventional machining necessitates preformed tungsten carbide and pre-formed steel shanks. EDM machines the carbide, brazing material and steel simultaneously, and requires no indexing to assure a perfectly formed broach as to location and size.

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Conventionally machined, the pine tree broach requires 22 operations. EDM does it better in 14.

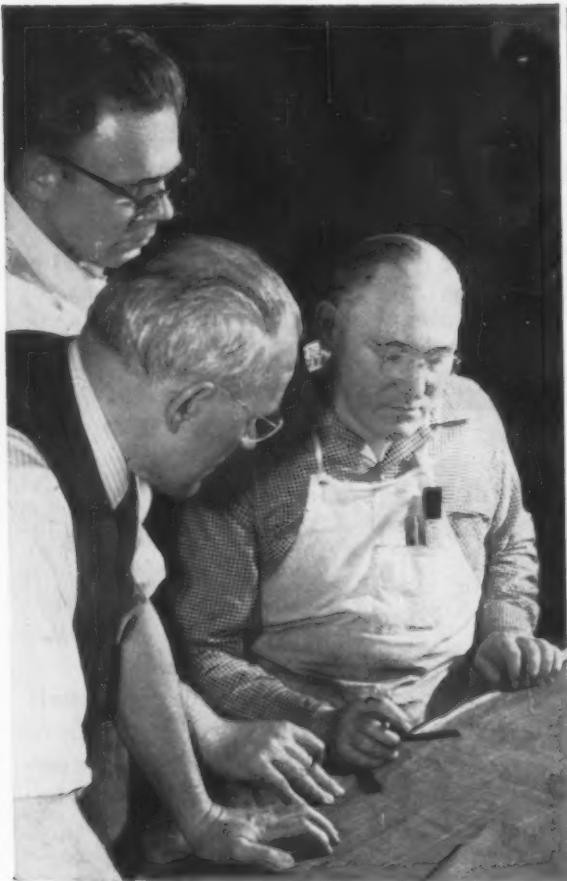
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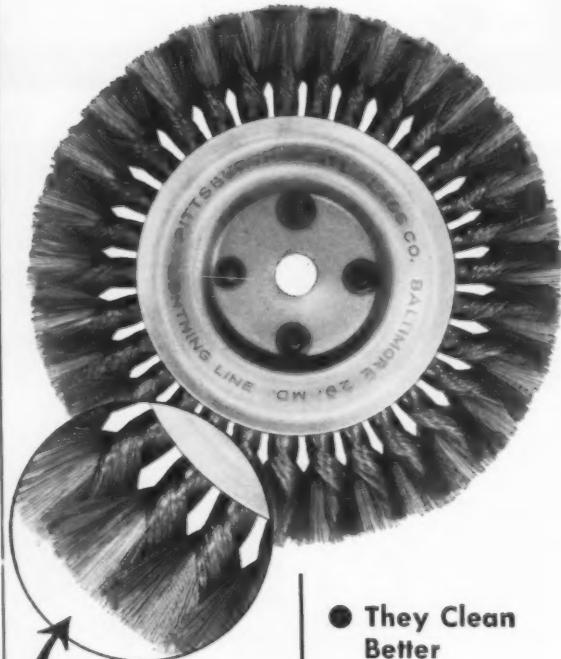
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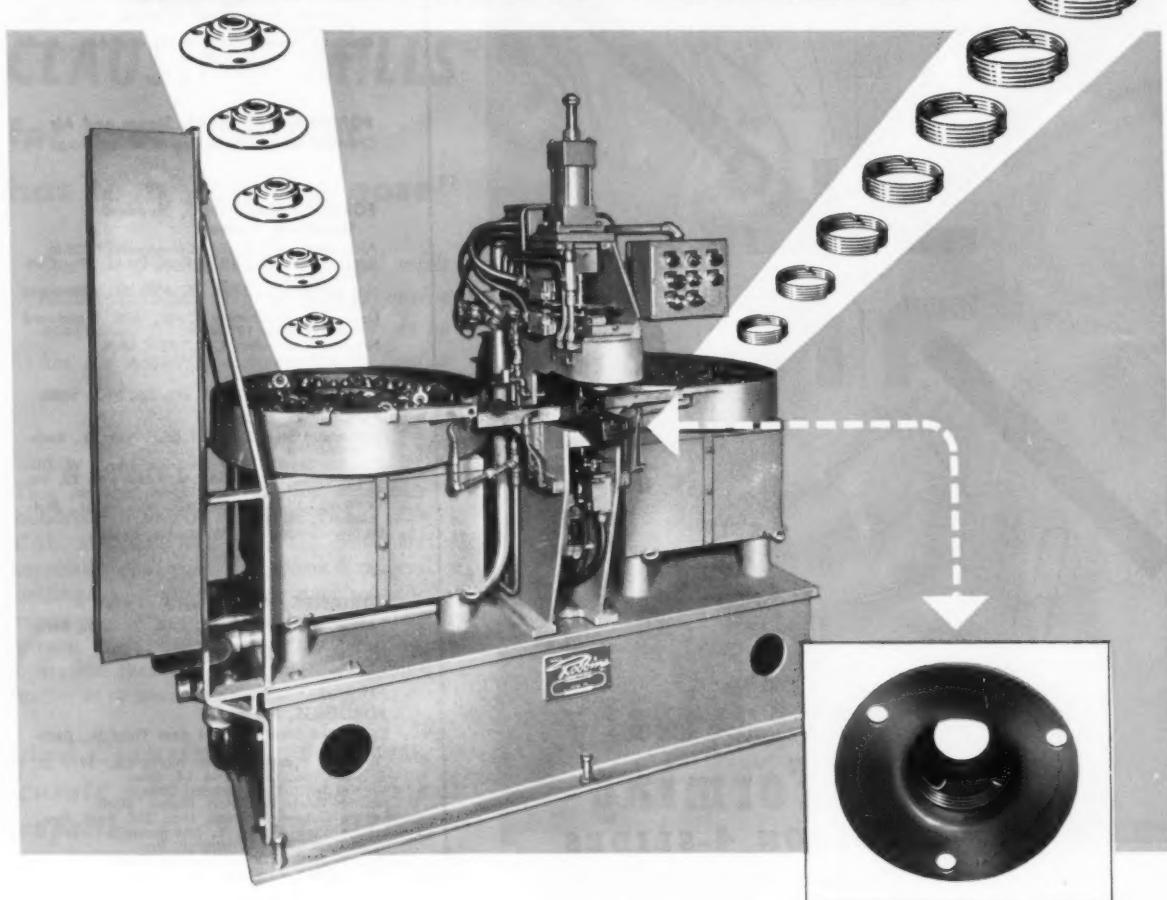


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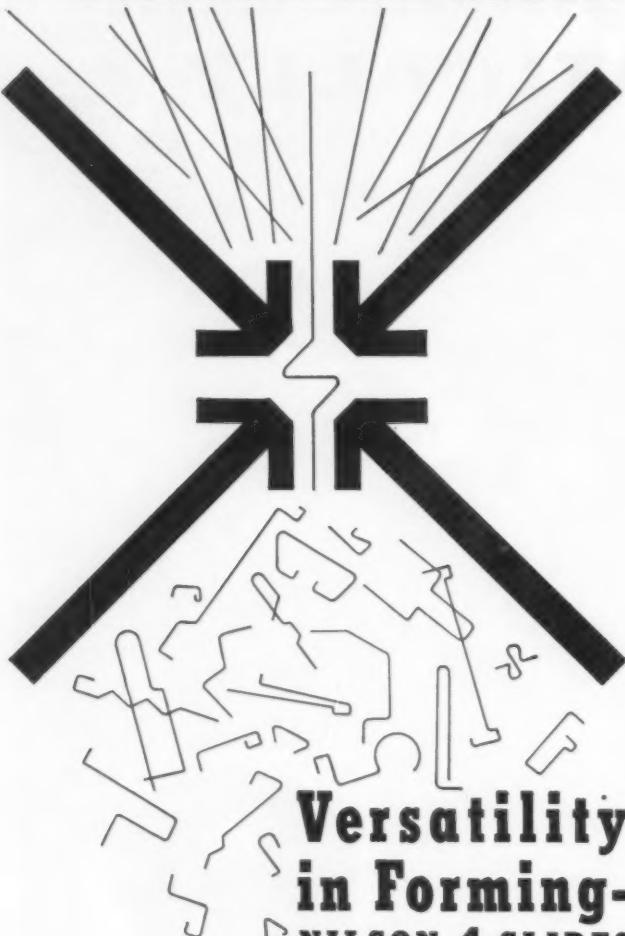


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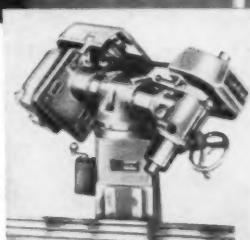
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5. Spindle taper (internal) run out within .0002 at spindle nose.
6. Table T-slots parallel to table dovetail ways within .0005" in 8" longitudinal travel.

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## CONDENSED SPECIFICATIONS

|  |          |                                      |                    |
|--|----------|--------------------------------------|--------------------|
| Size of Table.....   | 6" x 24" | Vertical Table Travel .....          | 11 $\frac{1}{2}$ " |
| Longitudinal Table Travel.....   | 15"      | Max. Distance Spindle to Column..... | 8 $\frac{1}{2}$ "  |
| Cross Table Travel.....  | 5"       | Spindle Travel .....                 | 3"                 |
| Spindle Speeds: Six, 180 to 3250 RPM. No. 7 Brown and Sharpe or No. 2 Morse Taper Spindle Optional. Operates from $\frac{1}{2}$ to $\frac{3}{4}$ H.P., 1725 RPM motor. |          |                                      |                    |

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Combination type laboratory mill. Can be used two-high or four-high, with driven back-up rolls.

*Why*

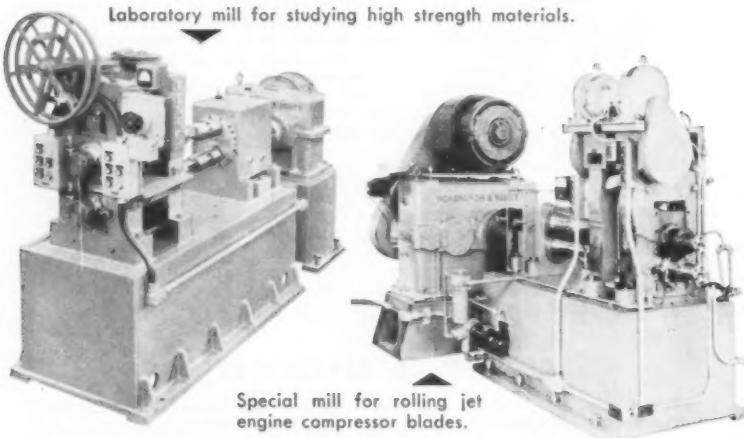
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#### GAGES, Automatic Sorting

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(Continued on page 330)



# Holes, Contours, Surfaces

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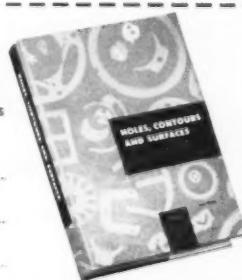
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 Gleason Works, 1000 University Ave., Rochester 3, N. Y.  
 Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.  
 National Broach & Mch. Co., 5600 St. Jean, Detroit 2, Mich.  
 Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

**GEAR MOTORS**—See Speed Reducers

**GEAR RACKS**

Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.  
 Illinois Gear & Mch. Co., 2108 No. Natchez Ave., Chicago 35, Ill.  
 Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.  
 Stahl Gear & Mch. Co., The, 3901 Hamilton Ave., Cleveland 4, Ohio

**GEAR SHAPERS**

Fellows Gear Shaper Co., Springfield, Vt.  
 Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.  
 National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.  
 Fellows Gear Shaper Co., Springfield, Vt.  
 Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.  
 National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

**GEARS, AND GEAR BLANKS, Non-metallic**

Boston Gear Works, 14 Hayward St., Quincy 71, Mass.  
 Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio  
 Diefendorf Gear Corp., Box 934, Syracuse, N. Y.

Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.  
 Greaves Machine Tool Co., 2011 Eastern Ave., Cincinnati, Ohio  
 Illinois Gear & Mch. Co., 2108 No. Natchez Ave., Chicago 35, Ill.  
 New Jersey Gear & Mfg. Co., Hillside, N. J.  
 Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.  
 Ryerson, Jos. T. & Son, Inc., 16th and Rockwell St., Chicago 8, Ill.  
 Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio

**GEARS, Cut**

Automotive Gear Works, Inc., South 8th & O St., Richmond, Ind.  
 Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.  
 Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
 Boston Gear Works, 14 Hayward St., Quincy 71, Mass.  
 Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio  
 Cone Drive Gear Div., 7171 E. McNichols Rd., Detroit 12, Mich.  
 Diefendorf Gear Corp., Box 934, Syracuse, N. Y.  
 Fairfield Mfg. Co., 2309 S. Earl Ave., Lafayette, Ind.  
 Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.  
 Greaves Machine Tool Co., 2011 Eastern Ave., Cincinnati, Ohio  
 Harsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio  
 Illinois Gear & Mch. Co., 2100 No. Natchez Ave., Chicago 35, Ill.  
 James, D. O., Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill.  
 National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.  
 New Jersey Gear Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.  
 Perkins Machine & Gear Co., W. Springfield, Mass.  
 Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.  
 Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio  
 Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

**GENERATORS, Electric**

Allis-Chalmers Mfg. Co., Milwaukee, Wis.  
 General Electric Co., Schenectady, N. Y.  
 Reliance Electric & Engrg. Co., 1200 Ivanhoe Rd., Cleveland 10, Ohio

**GRADUATING MACHINES**

Gorton, Geo., Mch. Co., 1321 Racine St., Racine, Wis.

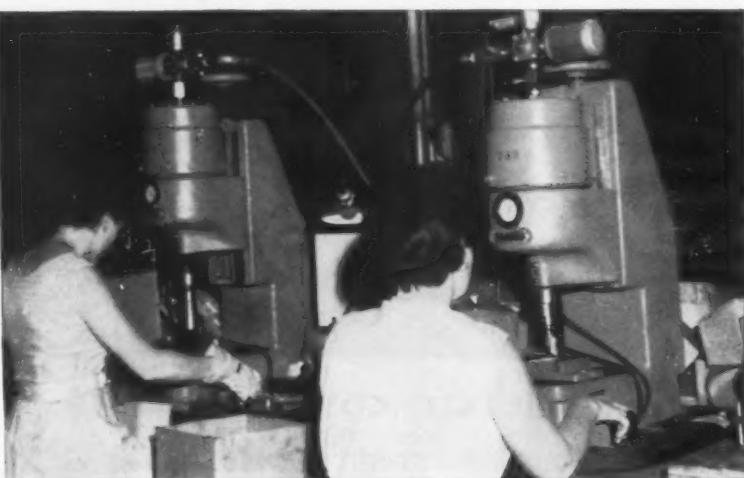
**GREASES**—See Lubricating Oils and Greases

**GRINDERS, Bench, Floor and Snag**

Delta Power Tool Div., 400 Lexington Ave., Pittsburgh, Pa.  
 Jones & Lamson Mch. Co., Springfield, Vt.  
 Mumford-Dixon Co., Hanover, Pa.  
 National Acme Co., 170 E. 131st St., Cleveland 8, Ohio  
 South Bend Lathe Works, South Bend 22, Ind.  
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio  
 Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.  
 U. S. Burke Machine Tool Div., Brotherton Rd., Cincinnati 27, Ohio

**GRINDERS, Carbide Tool**

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.  
 Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh, Pa.  
 Elox Corp. of Mich., Royal Oak 3, Mich.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Heald Machine Co., 10 New Bond St., Worcester 6, Mass.  
 LeMaire Tool & Mfg. Co., Dearborn, Mich.  
 Metallurgical Products Dept. of General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.  
 Norton Co., 1 New Bond St., Worcester 6, Mass.  
 Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.  
 Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
 Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio  
 Wesson Co., 1220 Woodward Heights Blvd., Detroit 20, Mich.



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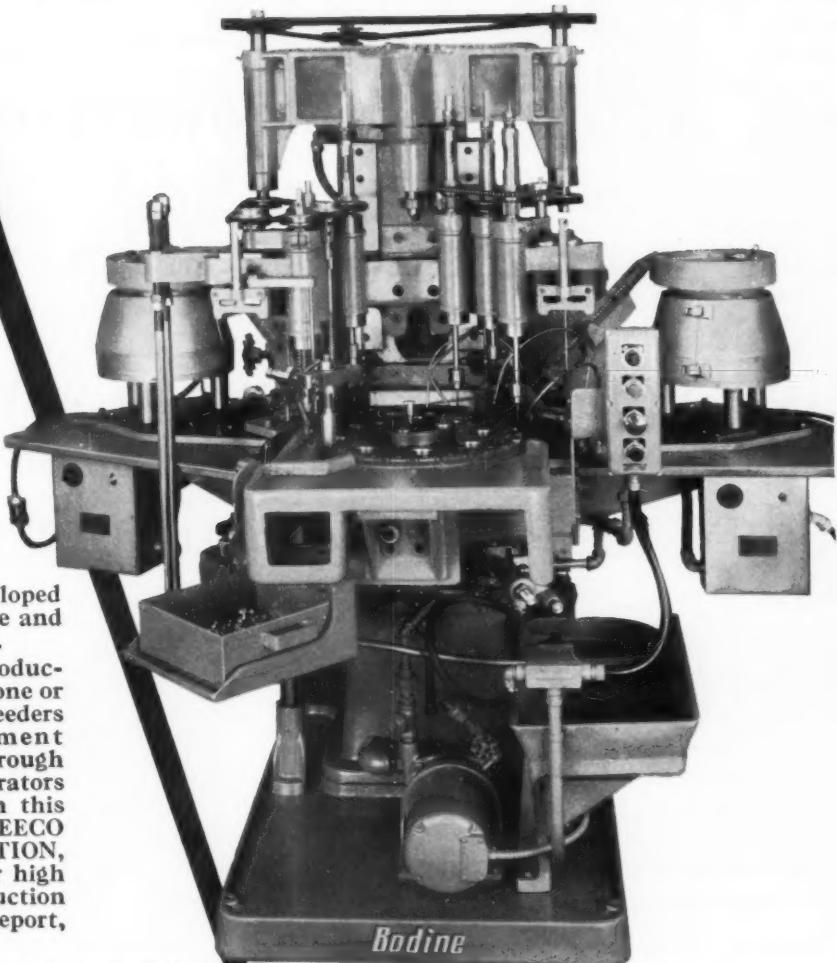
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Send me, without charge, Thor's 24 page automation manual on multiple nut setting and screwdriving. I understand this manual answers all the questions about multiple operation in large or small assembly set-ups.



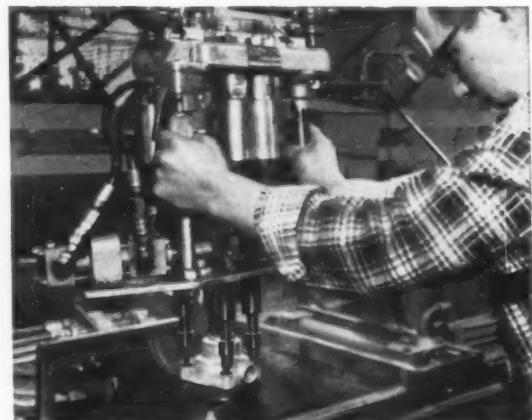
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Company \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_



This Thor Multiple is setting 4 bolts at one time



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\* Milwaukee \* Newark \* Long Island City, N.Y. \* Philadelphia  
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\* Toronto, Canada \* Export Division, New York City

**GRINDERS, Die and Mold**

Norton Co., 1 New Bond St., Worcester 6, Mass.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio

**GRINDERS, Drill Point**

Atlas Press Co., 20108 N. Pitcher, Kalamazoo, Mich.  
Consolidated Mch. Tool Div., 565 Blossom Rd., Rochester 10, N. Y.  
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.  
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Standard Electrical Tool Co., 2500 River Rd., Cincinnati 4, Ohio

**GRINDERS, Face Mill**

Kearney & Trecker Corp., Milwaukee 14, Wis.  
Mattison Machine Works, 545 Blackhawk Park Ave., Rockford, Ill.  
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

**GRINDERS, Knife and Shear**

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
Mattison Machine Works, Rockford, Ill.  
Mummert-Dixon Co., Hanover, Pa.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio

**GRINDERS, Portable Electric**

Chicago Pneumatic Tool Co., New York 17, N. Y.  
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
Standard Electrical Tool Co., 2488-90 River, Cincinnati 4, Ohio  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

**GRINDERS, Portable Pneumatic**

Chicago Pneumatic Tool Co., New York 17, N. Y.  
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
Madison-Kipp Corp., Madison, Wis.  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

**GRINDERS, Tap**

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.  
Rockford Die & Tool Wks., Inc., Rockford, Ill.

**GRINDERS, Tool and Cutter**

Atlas Press Co., 20108 N. Pitcher, Kalamazoo, Mich.  
Barber-Colman Co., Rock and Montague, Rockford, Ill.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Cincinnati Milling and Grinding Mch., Cincinnati 9, Ohio  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Delta Power Tool Div., 400 Lexington Ave., Pittsburgh, Pa.  
Elox Corp. of Mich., Royal Oak 3, Mich.  
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.  
Gallmeyer & Livingston Co., 336 Straight Ave., S. W., Grand Rapids 4, Mich.  
Gleason Works, 1000 University Ave., Rochester 3, N. Y.  
Gorton, Gao, Mch. Co., 1321 Racine St., Racine, Wis.  
Homestrand, Inc., Larchmont, N. Y.  
Landis Tool Co., Waynesboro, Pa.  
LeBlond, R. K. Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio  
Mummert-Dixon Co., Hanover, Pa.  
National Acme Co., 170 E. 131st St., Cleveland 8, Ohio  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
South Bend Lathe Wks., South Bend 22, Ind.  
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio

**GRINDERS, Toolpost**

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio

**GRINDING GAGES—See Gages, Grinding****GRINDING MACHINES, Abrasive Belt**

Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.  
Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
Mattison Mch. Works, Rockford, Ill.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.  
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

**GRINDING MACHINES, Broach**

Colonial Broach & Machine Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.  
Gallmeyer & Livingston Co., 336 Straight, S. W., Grand Rapids 2, Mich.  
Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.  
National Broach & Mch. Co., 5600 St. Jean, Detroit 13, Mich.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Thompson Grinder, 1534 W. Main, Springfield, Ohio

**GRINDING MACHINES, Cam**

Landis Tool Co., Waynesboro, Pa.  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Van Norman Mch. Co., 3640 Main St., Springfield 7, Mass.

**GRINDING MACHINES, Centerless**

Bryant Chucking Grinder Co., Clinton St., Springfield, Vt.  
Cincinnati Milling and Grinding Mch., Inc., Cincinnati 9, Ohio  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Head Machine Co., 10 New Bond St., Worcester 6, Mass.  
Landis Tool Co., Waynesboro, Pa.  
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.  
Van Norman Mch. Co., Springfield, Mass.

**GRINDING MACHINES, Crankshaft**

Landis Tool Co., Waynesboro, Pa.  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Van Norman Mch. Co., Springfield, Mass.

**GRINDING MACHINES, Cylindrical**

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Cincinnati Milling and Grinding Mch., Inc., Cincinnati 9, Ohio  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Frauenthal Div., Muskegon, Mich.  
Gallmeyer & Livingston Co., 336 Straight, S. W., Grand Rapids 2, Mich.  
Landis Tool Co., Inc., Waynesboro, Pa.  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Sheffield Corp., Box 893, Dayton 1, Ohio  
Standard Electrical Tool Co., 2500 River Rd., Cincinnati 4, Ohio  
Van Norman Co., 2640 Main St., Springfield 7, Mass.

**GRINDING MACHINES, Disc**

Brown & Sharpe Mfg. Co., Providence, R. I.  
Delta Power Tools Div., 400 Lexington Ave., Pittsburgh 8, Pa.  
Gardner Machine Co., Beloit, Wis.  
Mattison Machine Works, Rockford, Ill.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio

**GRINDING MACHINES, Gear**

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Gear Grinding Mch. Co., 3901 Christopher St., Detroit 11, Mich.  
Gleason Works, 1000 University Ave., Rochester 3, N. Y.  
Lees-Bradner Co., Cleveland, Ohio  
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.  
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.  
Sheffield Corp., Box 893, Dayton 1, Ohio

**GRINDING MACHINES, Internal**

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.  
Bryant Chucking Grinder Co., Clinton St., Springfield, Vt.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Frauenthal Div., Muskegon, Mich.  
Gallmeyer & Livingston Co., 336 Straight, S.W., Grand Rapids 2, Mich.  
Harford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
Head Machine Co., 10 New Bond St., Worcester 6, Mass.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio  
Van Norman Mch. Co., Springfield, Mass.  
Wicaco Machine Corp., Wayne Junction, Philadelphia, Pa.

**GRINDING MACHINES, Jig**

Fosdick Mch. Tool Co., 1638 Blue Rock St., Cincinnati 23, Ohio  
Gallmeyer & Livingston Co., 336 Straight, S.W., Grand Rapids 2, Mich.  
Moore Special Tool Co., Inc., 740 Union Ave., Bridgeport, Conn.

**GRINDING MACHINES, Profile**

Baker Brothers, Inc., 1000 Post St., Toledo 10, Ohio  
Cincinnati Milling and Grinding Mch., Inc., Cincinnati 9, Ohio  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Jones & Lamson Mch. Co., Springfield, Vt.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Sheffield Corp., Box 893, Dayton 1, Ohio

**GRINDING MACHINES, Roll**

Landis Tool Co., Waynesboro, Pa.

**GRINDING MACHINES, Surface Reciprocating**

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Cincinnati Milling and Grinding Mch., Inc., Cincinnati 9, Ohio  
Delta Power Tool Div., 400 Lexington Ave., Pittsburgh, Pa.  
DoAll Co., Des Plaines, Ill.  
Elox Corp. of Mich., Royal Oak 3, Mich.  
Foot-Burt Co., 13000 St. Clair Ave., Cleveland 8, Ohio  
Gallmeyer & Livingston Co., 336 Straight Ave., S. W., Grand Rapids 4, Mich.  
Gardner Machine Co., Beloit, Wis.  
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
Homestrand, Inc., Larchmont, N. Y.  
Mattison Machine Works, Rockford, Ill.  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio  
Van Norman Mch. Co., Springfield, Mass.

**GRINDING MACHINES, Surface Rotary**

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. (Rotary)

(Continued on page 336)



## TORQUE CONTROL IMPACTOOLS consistently run nuts to prescribed torques

- I-R Torsion-Bar Impactools now assure top quality control on these 3 operations:
1. Assembling differential main bearing caps at 450 ft. lbs. both before and after machining as shown above.
  2. Preloading differential drive pinion bearing with Impactools set at 375 ft. lbs.
  3. Assembling wheels to wheel hubs at 425 ft. lbs.

Quality control has risen to a new high for this large manufacturer of farm equipment since I-R Torsion-Bar Torque Control Impactools were installed.

These Impactools are the *only* power wrenches that deliver full power and speed until the preset torque is reached, and then instantly and automatically shut off.

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## TORQUE CONTROL

Blanchard Machine Co., 64 State St., Cambridge, Mass.  
Gardner Machine Co., Beloit, Wis.  
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.  
Mattison Machine Works, Rockford, Ill.  
National Acme Co., 170 E. 131st St., Cleveland 8, Ohio  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N.J.  
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio  
Van Norman Mch. Co., Springfield, Mass.  
Walker, O. S., Co., Inc., Worcester, Mass.

### GRINDING MACHINES, Thread

Cosa Corp., 405 Lexington Ave., New York 17, N.Y.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Jones & Lamson Mch Co., Springfield, Vt.  
Landis Machine Co. (Centerless), Waynesboro, Pa.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N.J.  
Sheffield Corp., Box 893, Dayton 1, Ohio

### GRINDING MACHINES, Universal

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N.Y.  
Brown & Sharpe Mfg. Co., Providence, R.I.  
Cincinnati Milling and Grinding Mch's., Inc., Cincinnati 9, Ohio  
Cosa Corp., 405 Lexington Ave., New York 17, N.Y.  
Frauenthal Div., Muskegon, Mich.  
Gallmeyer & Livingston Co., 336 Straight, S.W., Grand Rapids 2, Mich.  
Gorton Mch. Co., Geo., 1321 Racine St., Racine, Wis.  
Jones & Lamson Mch. Co., Springfield, Vt.  
Landis Tool Co., Waynesboro, Pa.  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N.J.  
Parker-Majestic, Inc., 147 Joseph Campau, Detroit, Mich.  
Springfield Mch. Tool Co., 613 W. Southern Ave., Springfield, Ohio

### GRINDING WHEEL DRESSING AND FORMING DEVICES

DoAll Co., Des Plaines, Ill.  
Jones & Lamson Mch. Co., Springfield, Vt.  
Metal Carbides Corp., Youngstown, Ohio  
Moore Special Tool Co., Inc., 740 Union Ave., Bridgeport 7, Conn.  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Sheffield Corp., Box 893, Dayton 1, Ohio

### GRINDING WHEELS

Blanchard Machine Co., 64 State St., Cambridge, Mass.  
Cincinnati Milling and Grinding Mch's., Inc., Cincinnati 9, Ohio  
Cincinnati Milling Products Div., Cincinnati 9, Ohio  
Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.  
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.  
Gardner Machine Co., Beloit, Wis.  
Macklin Co., Jackson, Michigan  
Metal Carbides Corp., Youngstown, Ohio  
Norton Co., 1 New Bond St., Worcester 6, Mass.  
Simonds Abrasive Co., Tacony and Fraley St., Bridgesburg, Philadelphia, Pa.

### GROOVING TOOLS, Internal

Scully-Jones & Co., 1906 So. Rockwell St., Chicago 8, Ill.  
Waldes Kohinoor, Inc., 47-16 Austel Place, Long Island City 1, N.Y.  
Wesson Co., 1220 Woodward Heights Blvd., Detroit 26, Mich.

**HAMMERS, Drop**—See Forging Hammers

**HAMMERS, Portable Electric**

Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

**HAMMERS, Portable Pneumatic**

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

**HAMMERS, Power**

Chambersburg Engrg. Co., Chambersburg, Pa.  
Edlund Mchry. Co. Div., Cortland, N. Y.  
Yoder Co., 5504 Walworth Ave., Cleveland 2, Ohio

**HARDENING FURNACES**

General Electric Co., Schenectady, N. Y.  
Holcroft & Co., 6545 Epworth Blvd., Detroit 10, Mich.

**HARDNESS TESTERS**

Shore Instrument & Mfg. Co., 90-35C Van Wyck Exp., Jamaica 35, N. Y.  
Wilson Mechanical Instrument Co., Inc., 230-D Park Ave., New York, N. Y.

**HEAT-TREATING EQUIPMENT**—See Annealing Furnaces, Flame Hardening Machines, Induction-heating Equipment**HOBES**

Barber-Colman Co., Rockford and Montague, Rockford, Ill.  
Hanson-Whitney Co., 169 Bartholomew Ave., Hartford 3, Conn.  
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.  
National Twist Drill & Tool Co., Rochester, Mich.  
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.  
Star Cutter Co., 34500 Grand River, Farmington, Mich.

**HOISTS, Air**

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

**HOISTS, Electric**

Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.

**HONING MACHINES**

Barnes Drill Co., 814 Chestnut, Rockford, Ill.  
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.  
Moline Tool Co., 102-20th St., Moline, Ill.  
Van Norman Mch. Co., 3640 Main St., Springfield 7, Mass.

**HONING STONES**

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.  
Norton Co., 1 New Bond St., Worcester 6, Mass.

**HOSE**

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.  
Schrader's Son, A., 470 Vanderbilt Ave., Brooklyn 38, N. Y.

**HYDRAULIC MACHINERY****Tools and equipment**

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.  
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.  
Bethlehem Steel Corp., Bethlehem, Pa.  
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.

(Continued on page 340)

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f-a-s-t →  
in fastening*

*... and improve  
quality, too ...*



with  
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**ASSEMBLY  
MACHINES**  
for  
running nuts  
and  
driving screws!



- first in experience
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- first in service

Any bolt size... any number of spindles... maintains desired torque manual or completely automatic operation. Write for an Ingersoll-Rand AIRengineer to survey your needs.

Automatic assembly machine feeds and drives four self tapping screws in three seconds.

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**Why**

# MICROHONING

## Is Final Stock Removal Process For Interrupted and Blind-End Bores

To secure low-cost, final stock removal, that generates accuracy and functional surface characteristics in a variety of bore conditions, a leading manufacturer of power steering assemblies uses Microhoning. Here are details concerning types of bores and stock removal results obtained by using Micromatic "Know How"—



**STEERING GEAR HOUSING**—Microhoning consistently corrects cumulative inaccuracies of preceding operations—reduces scrap—permits faster boring—cuts boring tool sharpenings—lowers down-time and tool costs.

**Material:** Soft Malleable Iron  
**Bore:** 3.125"D x 6.93" L  
(Ported bore with  $\frac{1}{4}$ " relief at blind end)

**Stock Removal:** .002"  
**Finish:** 50 Microinches RMS  
**Microhoning Cycle:** 18 sec.  
**Preceding Operation:**  
Boring



**PISTON RACK**—Microhoning answers the need for a final stock removal process that generates a controlled surface finish in the bore of this leaded steel part. Microhoned surface (cross hatch) prevents oil leakage and holds to a minimum the wear of seal that operates in the bore.

**Material:** Leaded Steel  
(Rockwell 62 "C")  
**Bore:** .875"D x 3" L  
**Stock Removal:** .005"

**Finish:** 20 Microinches RMS  
**Microhoning Cycle:** 20 sec.  
**Preceding Operation:**  
Boring and H.T.



**VALVE HOUSING**—Microhoning consistently holds size and geometric accuracy—meets stringent surface requirements—assures alignment of four lands in bore. Thus, there is no leakage of oil around control valve which is selectively fitted to its housing.

**Material:** Cast Iron  
**Bore:** .770"D x 2.18" L  
(Interrupted)  
**Stock Removal:** .0025"  
**Tolerances:** Size .0005"

**Roundness .0001"**  
**Straightness .0001"**  
**Finish:** 10 Microinches RMS  
**Microhoning Cycle:** 12 sec.  
**Preceding Operation:** Boring

The principles and application of Microhoning are explained in a 30-minute, 16mm, sound movie, "Progress in Precision" . . . available at your request.

- Please send me "Progress in Precision" in time for showing on \_\_\_\_\_ (date).
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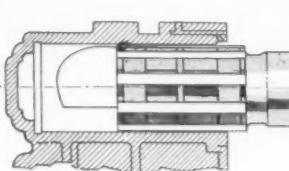
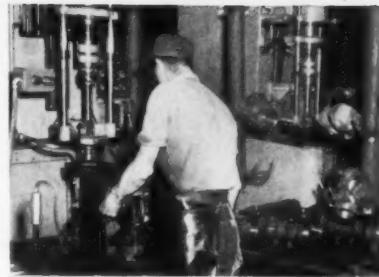
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(Continued on page 342)

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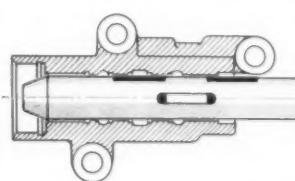
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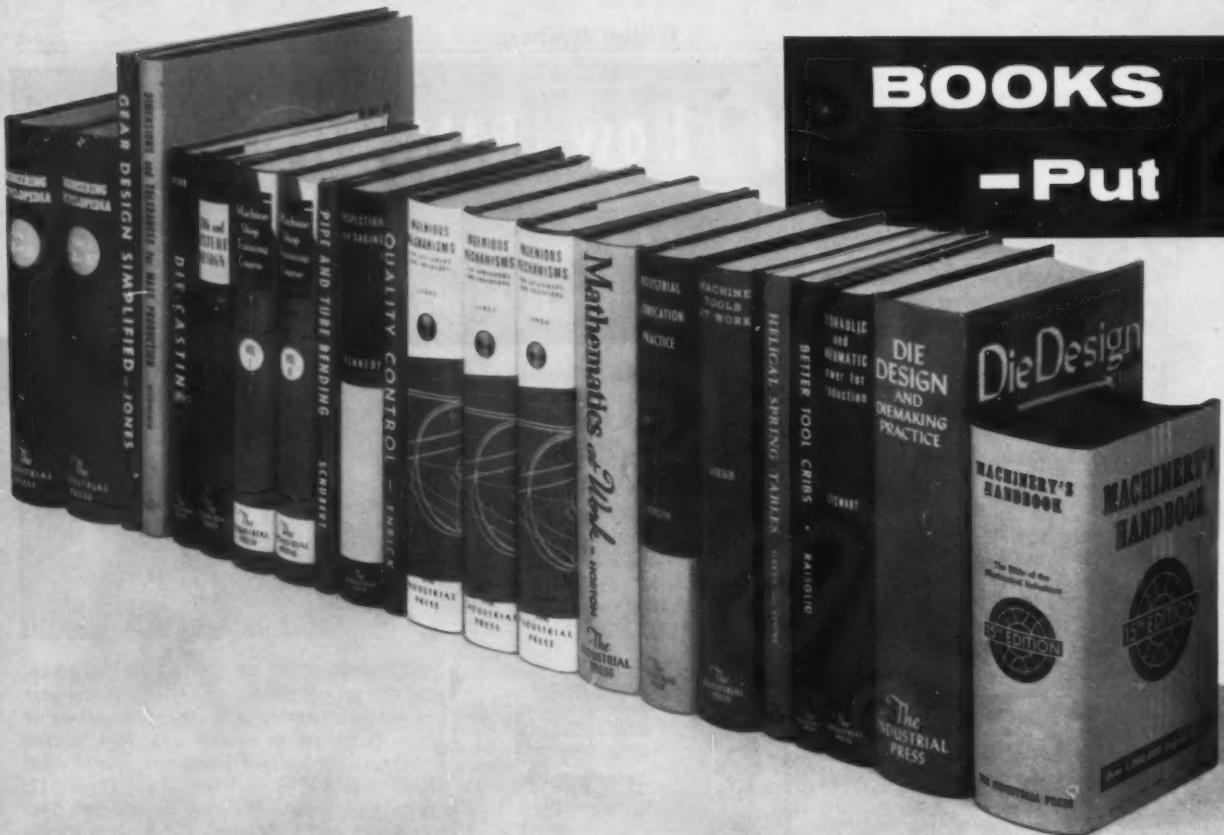


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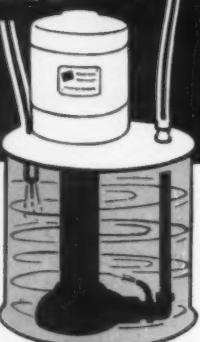
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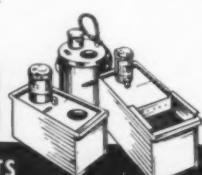
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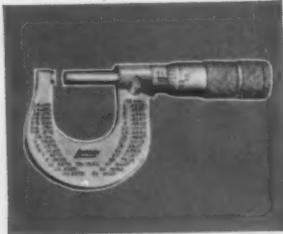
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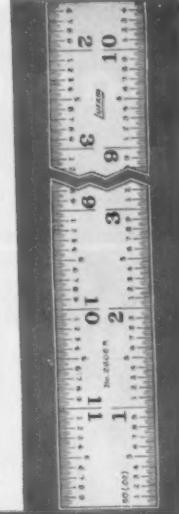
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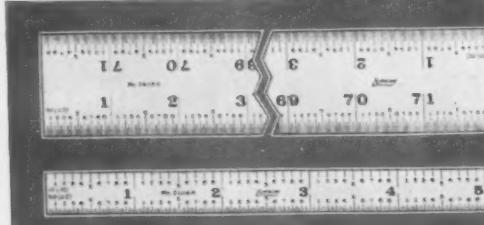
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Sidney Machine Tool Co., Sidney, Ohio  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
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Cosa Corp., 405 Lexington Ave., New York 17, N.Y.  
Hardinge Bros. Inc., 1420 College Ave., Elmhira, N.Y.  
Homestrand, Inc., Larchmont, N.Y.  
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio  
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio  
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N.J.  
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.  
Shoemaker Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.  
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LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio  
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Monarch Mch. Tool Co., Oak St., Sidney, Ohio

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LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio  
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(Continued on page 346)

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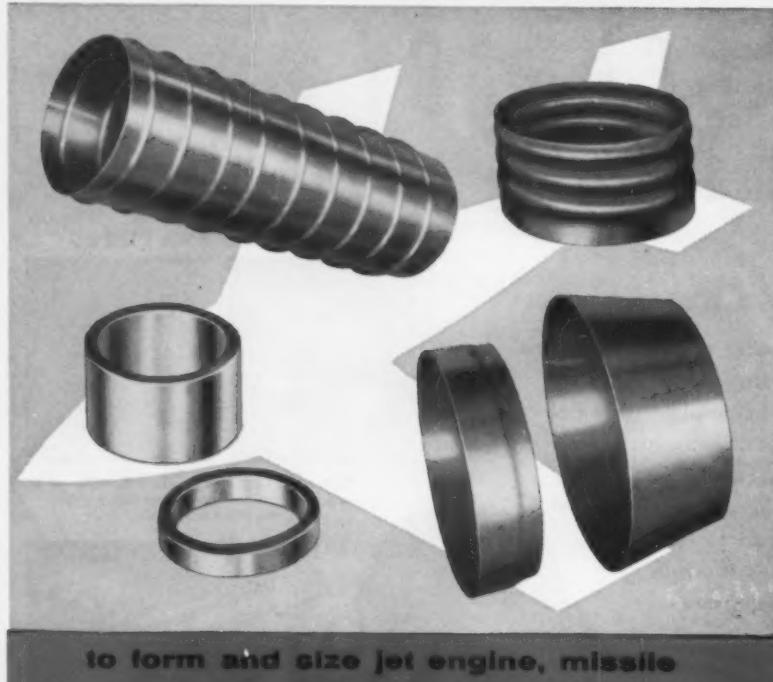
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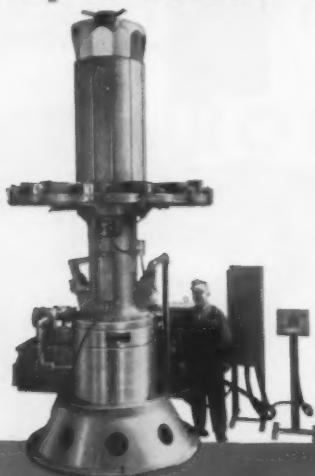


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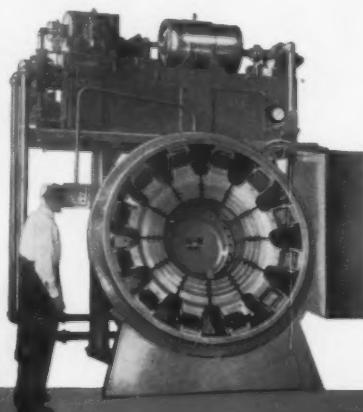
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**LATHES, Toolroom**—See Lathes, Engine, Toolroom

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Jones & Lamson Mch. Co., 512 Clinton St., Springfield, Vt.  
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New Britain Mch. Co., New Britain-Gridley Div., New Britain, Conn.

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Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
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Jones & Lamson Mch. Co., 512 Clinton St., Springfield, Vt.  
Levin & Son, Inc., Louis, Los Angeles 8, Calif.  
Morey Machinery Co., 383 Lafayette St., New York 3, N. Y.  
New Britain Mch. Co., New Britain-Gridley Div., New Britain, Conn.  
Seewald Inc., 1956 Woodbridge Ave., New Brunswick, N. J.  
Seneca Falls, Mch. Co., Seneca Falls, N. Y.  
Sheldon Mch. Co., Inc., 4258 N. Knox Ave., Chicago 41, Ill.  
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C-5077

### CASE I

Job illustrated above is profiling motor shafts of SAE 1045 and 4150; Brinell 200-300; length, 24" to 96". When clamped tools with various carbides were used, costs averaged \$311 per month for 18 months' continuous production. Kindex tools with Kennametal Grade K21 throw-away inserts, in the first half-year period, cut the cost to \$102.70 per month. (For detailed data, ask for Performance Report No. 540.)

### CASE II

In a production run turning countershaft pinions, SAE 4140; Brinell 212; length 4½"; Kindex tooling with the same K21 grade of insert cut tool cost to one-seventh that of previously-used insert tools. (Details—Performance Report No. 533.)

### CASE III

In turning alloy steel rotor shafts, 34 to 36 Rockwell C, tool cost per piece was reduced from \$.041 to \$.022 when brazed tools were replaced with Kindex Roller Turner and Grade K21 inserts. Added savings came from higher speeds and less downtime. (Performance Report No. 537.)



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DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.  
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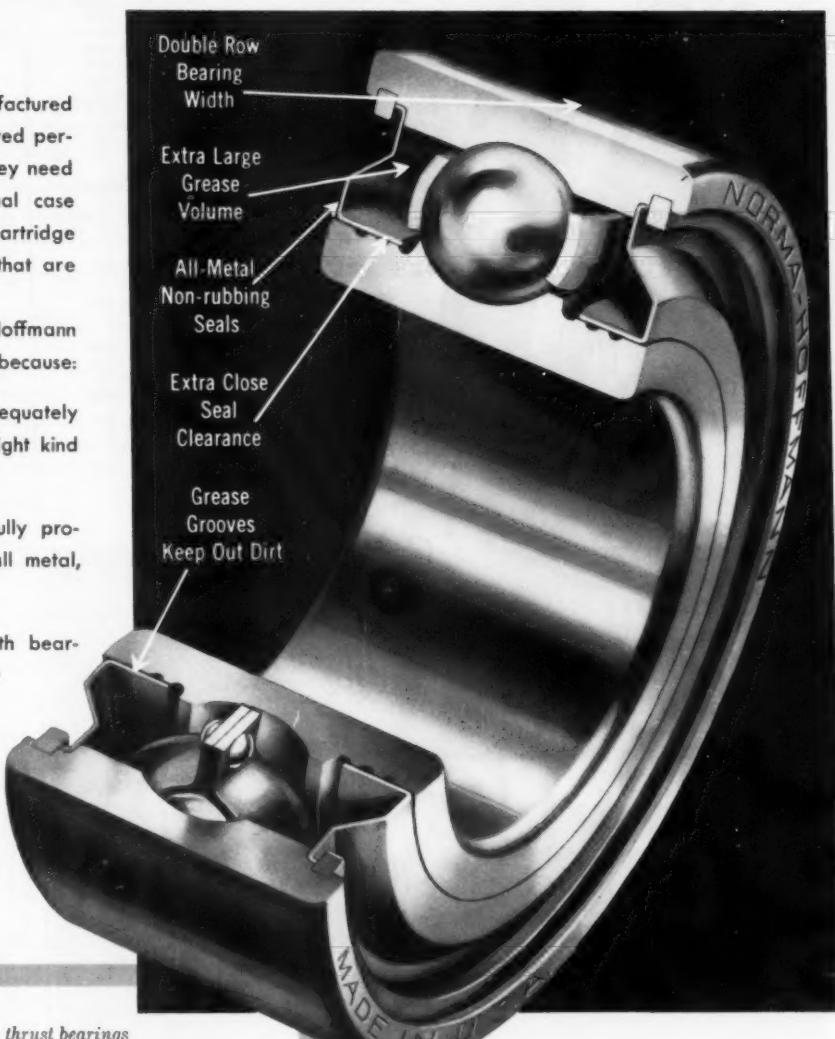
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Kearney & Trecker Corp., Milwaukee, Wis.  
Moran Machinery Corp., Yonkers, N. Y.  
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.  
Pratt & Whitney Co., Inc., West Hartford, Conn.  
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Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Morey Machinery Co., 383 Lafayette St., New York 3, N. Y.  
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Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.  
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.  
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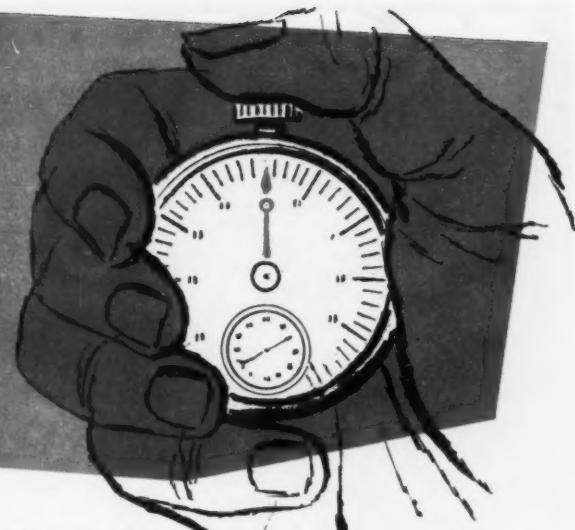
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(Continued on page 352)

# how do you measure your production?



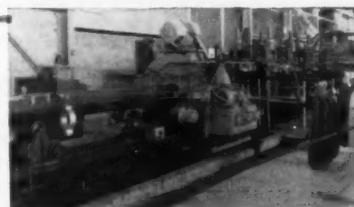
There is a *just-right* production speed for every job. Run a little faster and you'll have trouble—a little slower and your equipment is not being used efficiently. A Reliance V-S Drive will give you the *just-right* speed for each job.

Reliance V-S is an all-electric drive that operates from a-c. circuits. The operator varies the drive motor rpm. to set up the ideal speed for every job. With no rigid set of gear ratios with a limiting number of speeds, he has an infinite selection of rpm.'s from a wide flexible band of operating speeds.

There is a V-S Drive designed for your equipment. Write for Bulletin D-2311.

## • TONS PER HOUR — — — — —

In order to maintain a uniform production rate of 80 tons per hour with varying sizes of pipe, this pipe mill must change its line speed from 30 ft. per minute to 80 ft. per minute to compensate for differing gauges of steel. A 500 hp. multi-motor V-S Drive does the job.



## • YARDS PER MINUTE — — — — —

In order to properly size differing types of cotton cloth, the textile slasher must operate at line speeds varying from 28 yds. per minute to 225 yds. per minute. A 25 hp. V-S Drive does the job.



## • REVOLUTIONS PER MINUTE — — — — —

In order to maintain the correct tension on the metal on this highly accurate rolling mill, the speed of the coil winder must decrease from 900 rpm. to 450 rpm. as the diameter of the roll builds up. A 20 hp. V-S Drive does the job, automatically.

D-1643



**RELIANCE**

ELECTRIC AND  
ENGINEERING CO.

DEPT. 39A, CLEVELAND 17, OHIO • CANADIAN DIVISION: WELLAND, ONTARIO

Sales Offices and Distributors in Principal Cities

For more information fill in page number on Inquiry Card, on page 255

MACHINERY, September, 1957—351



No. 13CB V-type cylinder boring unit is used either as an individual machine or as one of several automated units in a transfer line for boring automotive engine cylinders.

MR138 four-way, hydraulic feed, drilling, boring and facing machine with hydraulic clamping fixture for tractor main frame housings.

*For Greater*

### PRODUCTION... EFFICIENCY... SAVINGS

Use an individually designed "Hole-Hog" Machine Tool for such jobs as...

- Multi-Spindle Boring
- Single and Multi-Spindle Honing
- Straight Line Multi-Drilling
- Adjustable Spindle Drilling
- Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
- Special Multiple Operation Machine Tools

OVER 55 YEARS OF  
MACHINE TOOL ENGINEERING  
EXPERIENCE IS AT YOUR SERVICE.  
TELL US YOUR PARTICULAR  
PROBLEM

106

HD67 hydraulic rail feed, straight-line type, multi-spindle drilling machine. Six-foot rail length as shown; also available in eight and ten-foot lengths.

No. 116-U hydraulic rail feed, universal joint type driller with 16 two-speed and neutral top drivers plus four-speed quick change gear box. Spindles illustrated are  $1\frac{1}{2}$  drill capacity each in mild steel.



**MOLINE TOOL COMPANY**

REPRESENTATIVES IN PRINCIPAL CITIES

100 20TH STREET • MOLINE, ILLINOIS

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
G & L Ind Hypro Div., Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.  
Gortz George Machine Co., 1110 W. 13th St., Racine, Wis.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Morey Machinery Co., 383 Lafayette St., New York, 3, N. Y.  
Orson Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.  
Sundstrand Mach. Tool Co., 2531 - 11th St., Rockford, Ill.

### MILLING MACHINES, Knee Type, Horizontal, Plain, Universal

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.  
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Bullard Co., Bridgeport 6, Conn.  
Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
DeVlieg Machine Co., Ferndale, Mich.  
Gorton, Geo. Mch. Co., 1110 W. 13th St., Racine, Wis.  
Greaves Machine Tool Div., 2009 Eastern Ave., Cincinnati, Ohio  
Hardinge Bros., Inc., 1420 College Ave., Elmhira, N. Y.  
Homestrand, Inc., Larchmont, N. Y.  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.  
Van Norman Co., 3640 Main St., Springfield 7, Mass.

### MILLING MACHINES, Knee Type Rise and Fall

Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Homestrand, Inc., Larchmont, N. Y.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.

### MILLING MACHINES, Knee Type Ram

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Brown & Sharpe Mfg. Co., 235 Promenade St., Providence 1, R. I.  
Gorton Mch. Co., 1321 Racine St., Racine, Wis.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Van Norman Co., 3640 Main St., Springfield 7, Mass.

### MILLING MACHINES, Knee Type Turret

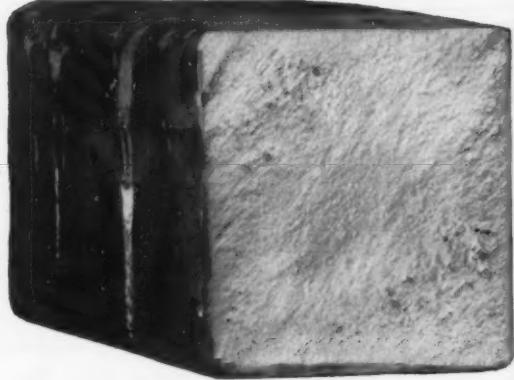
Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Gorton Mch. Co., 1321 Racine St., Racine, Wis.

### MILLING MACHINES, Knee Type, Vertical

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Atlas Press Co., Kalamazoo, Mich.  
Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.  
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Calif.  
Bridgeport Mches., Inc., 500 Lindley St., Bridgeport 6, Conn.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio  
Cosa Corp., 450 Lexington Ave., New York 17, N. Y.  
Gorton, Geo. Mch. Co., 1110 W. 13th St., Racine, Wis.  
Homestrand, Inc., Larchmont, N. Y.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.  
South Bend Lathe Wks., South Bend 22, Ind.

### MILLING MACHINES, Planer Type

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio  
(Continued on page 354)



# POROSITY CAN'T HIDE BEHIND THIS SQUARE CUT

## -WHEN YOU DIVIDE YOUR FORGING STOCK WITH A "BUFFALO" BILLET SHEAR

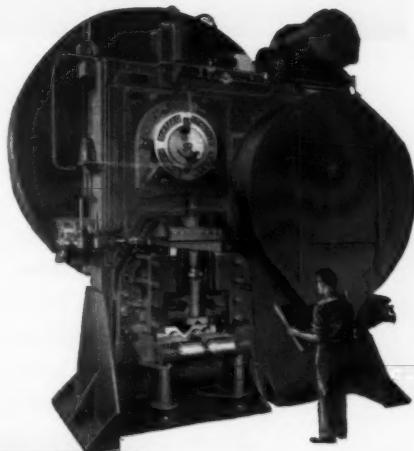
The time to detect porosity or "pipes" in your stock is *before* the forging, not afterwards, and that's one of many ways "Buffalo" Billet Shears save money.

The knives penetrate only  $\frac{3}{16}$ ", localizing a sharp, vertical fracture — perfectly square, without the "smearing" present on sawed or burned faces. This enhances visual inspection and prevents many a forging "reject".

Other savings with "Buffalo" Billet Shears are high cutting speeds — elimination of gas and burner expense — maintenance of uniform weight in billets — and minimum operating cost over the years.

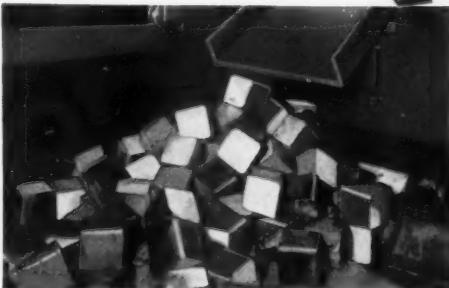
11 sizes are ready to meet your needs, the smallest handling  $2\frac{1}{4}$ " rounds or 2" squares at 30 strokes per minute — the largest handling 10" rounds or 9" squares at 6 strokes per minute. All have the "Q" Factor\* of engineering and workmanship that provides trouble-free satisfaction and long life in every "Buffalo" product. Write for Bulletin 3295-C and see how these Quality features can save you money.

\*The "Q" Factor—the built-in Quality which provides trouble-free satisfaction and long life.



540 PER HOUR

That's the output of a "Buffalo" No. 15 Billet Shear dividing 7" square stock in a large plant. Machine has automatic feed table and back gage. Above is a No. 17 Shear, largest in the line.



## BUFFALO FORGE COMPANY

440 Broadway • Buffalo, N.Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING SHEARING BENDING



BLAZING THE HEAT TREAT TRAIL WITH

**HOLCROFT**

# Let's Talk About Obsolescence

Obsolescence, unlike depreciation, is not a loss factor that can be estimated and provided for out of income. Yet, the operation of obsolete equipment does cost money . . . a cost that represents, more often than not, a loss far in excess of depreciation.

When you are buying new heat treat equipment, it is only good practice to buy with an eye to the future. By looking into such problems as atmospheres, automation, safety, mechanics, hydraulics and so on . . . today . . . you materially reduce tomorrow's obsolescence factor. Sometimes, existing furnaces can be redesigned with modern techniques and, as a result, can be geared to present production demands.

In any case, it is a good idea to talk over your problem with a Holcroft engineer. He has the technical know-how, the training and practical experience, to help you reduce early obsolescence in your plant. You'll find that Holcroft furnaces are built to answer today's problems—and tomorrow's too. Write for information.

## **HOLCROFT AND COMPANY**



6545 EPWORTH BOULEVARD • DETROIT 10, MICHIGAN  
PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

CHICAGO, ILL. • CLEVELAND, OHIO • HARTFORD, CONN. • HOUSTON, TEXAS • PHILA., PA.  
CANADA: Walker Metal Products, Ltd., Windsor, Ontario

6283

Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.  
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.  
Espan-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.  
G & L and Hypro Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Morey Machinery Co., 383 Lafayette St., New York 3, N. Y.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.

### MILLING MACHINES, Spar

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio  
Cincinnati Milling & Grinding Mches., Inc., 4701 Marburg Ave., Cincinnati 9, Ohio  
G & L and Hypro Div., Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.  
Kearney & Trecker Corp., Milwaukee, Wis.  
Morey Machinery Co., 383 Lafayette St., New York 3, N. Y.  
Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.

### MILLING MACHINES, Thread

Hanson-Whitney Co., 169 Bartholomew Ave., Hartford 3, Conn.

### MOLDING MACHINES, Plastic

Baker Bros., Inc., 1000 Post St., Toledo 10, Ohio  
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
Follows Gear Shaper Co., 78 River St., Springfield, Vt.  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
Watson-Stillman Co., Roselle, N. J.

### MOTORS, AIR

Ingersoll-Rand Co., Phillipsburg, N. J.

### MOTORS, Electric

Allis-Chalmers Mfg. Co., Milwaukee, Wis.  
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.  
General Electric Co., Schenectady, N. Y.  
Howell Electric Motors Co., Howell, Mich.  
Lincoln Electric Co., Cleveland 17, Ohio  
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio

### MOTORS, Hydraulic

Barnes, J. S., Corp., Rockford, Ill.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Hydraulic Press Mfg. Div., Mt. Gilead, Ohio  
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.  
Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.  
Vickers, Inc., Detroit 32, Mich.

**MULTIPLE INSPECTION GAGES**—See  
Gages, Multiple Inspection

### MULTIPLE-STATION MACHINES, Dial Type

Avey Drilling Mch. Co., 25 E. 3rd St., Covington, Ky.  
Baker Bros., Inc., 1000 Post St., Toledo 10, Ohio  
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.  
Bausch Mch. Tool Co., 15 Wason Ave., Springfield, Mass.  
Cross Co., 3250 Bellevue, Detroit 7, Mich.  
Etco Tool Co., Inc., 394 Johnson Ave., Brooklyn 37, N. Y.  
Federal Prod. Corp., 1144 Eddy St., Providence 1, R. I.  
Greenlee Bros. & Co., 2136 - 12th St., Rockford, Ill.  
Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
Kingsbury Mch. Tool Corp., Keene, N. H.  
LaSalle Tool, Inc., 3840 E. Outer Drive, Detroit 34, Mich.  
Modern Industrial Engrg. Co., 14230 Birwood Ave., Detroit 38, Mich.

(Continued on page 356)



## "**TRUKUT**® increased production 4 times..."



A small Mid-Western machine shop was confronted with an economic problem — production costs were too high — tool life was too short. While engaged in the job of cutting threads on 1020 16-gage electric welded steel tubing, the shop called in Sinclair Representative Raymond F. Ohm for help.

Mr. Ohm reports: "Tool life was a maximum of only 100 pieces before burning took place. Thread was very rough, due partly to chatter because of thin wall of tube."

"I recommended Sinclair **TRUKUT**® EP Soluble Oil, Grade C, because it affords greater emulsion stability, longer tool life and better finishes with close tolerance. It also gives a greater cooling and load-carrying capacity to prevent tool welding and burning."

"With **TRUKUT**, production has been increased four times. Four hundred or more pieces are produced before tool is replaced. Also — finish of threads is finer, and general appearance of the finished piece is better."

"The shop found **TRUKUT** EP, Grade C, so satisfactory that it now uses **TRUKUT** exclusively."

If you have a problem with cutting or grinding coolants, it will pay you to look into the advantages of Sinclair **TRUKUT** EP Soluble Oils. Contact your local Sinclair Representative, or write to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. There's no obligation.

DINO, the Sinclair Dinosaur, says:

"CONTACT YOUR  
SINCLAIR REPRESENTATIVE  
NOW!"

**SINCLAIR**

**CUTTING OILS and COOLANTS**

For more information fill in page number on Inquiry Card, on page 255

MACHINERY, September, 1957—355

National Automatic Tool Co., S. 7th N. Sts., Richmond, Ind.  
 Snyder Tool & Engrg. Co., 3400 E. Lafayette Ave., Detroit 7, Mich.  
 Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.

**MULTIPLE-STATION MACHINES,****Transfer Type**

Avey Drilling Mch. Co., 25 E. 3rd St., Covington, Ky.  
 Baker Bros., Inc., 1000 Post St., Toledo 10, Ohio  
 Barnes Drill Co., 814 Chestnut St., Rockford, Ill.  
 Baush Mch. Tool Co., 15 Watson Ave., Springfield, Mass.  
 Buhr Mch. Tool Co., 839 Green St., Ann Arbor, Mich.  
 Bullard Co., Bridgeport 6, Conn.  
 Cincinnati Milling Mch. Co., Cincinnati 9, Ohio  
 Clearing Mch. Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Davis & Thompson Co., 4460 N. 124th St., Milwaukee 10, Wis.  
 Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
 Greenlee Bros. & Co., 2136 - 12th St., Rockford, Ill.  
 Hartford Special Machinery Co., 287 Homestead Ave., Hartford, Conn.  
 Heald Machine Co., 10 New Bond St., Worcester 6, Mass.  
 Kearny & Trecker Corp., Milwaukee, Wis.  
 Le Maire Tool & Mfg. Co., Dearborn, Mich.  
 Modern Industrial Engrg. Co., 14230 Birwood Ave., Detroit 38, Mich.  
 Moline Tool Co., 102-20th St., Moline, Ill.  
 National Automatic Tool Co., S. 7th N. Sts., Richmond, Ind.  
 Norton Co., 1 New Bond St., Worcester 6, Mass.

Snyder Tool & Engrg. Co., 3400 E. Lafayette Ave., Detroit 7, Mich.  
 Sundstrand Mch. Tool Co., 2531 - 11th St., Rockford, Ill.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.

**NIBBLING MACHINES**

Fenway Machine Co., Inc., Willow Grove, Penna.  
 Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.  
 Wales-Strippit Corp., Akron, N. Y.

**NICKEL AND NICKEL ALLOYS**

Crucible Steel Co. of America, Henry W. Oliver Bldg., Mellon Square, Pittsburgh 22, Pa.

**NUT SETTERS**—See Screwdrivers, etc.**NUTS**—See Bolts, Nuts and Screws**OIL GROOVERS**

Wicaco Machine Corp., Wayne Junction, Philadelphia, Pa.

**OILERS AND LUBRICATORS**

Gits Bros. Mfg. Co., 1858 S. Kilbourn Ave., Chicago, Ill.  
 Madison-Kipp Corp., Madison, Wis.  
 Wicaco Mch. Corp., Philadelphia, Pa.

**OILS, CUTTING SOLUBLE**—See Cutting and Grinding Fluids

**OILS, Lubricating**—See Lubricating Oils and Greases

**OILS, Quenching and Tempering**

Cities Service Oil Co., 70 Pine St., New York, N. Y.  
 Shell Oil Co., 50 W. 50th St., New York, N. Y.  
 Sinclair Refining Co., 600 - 5th Ave., New York, N. Y.  
 Standard Oil Co. (Indiana), 910 S. Michigan Ave., Chicago 80, Ill.  
 Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa.

**OPTICAL FLATS**

Crane Packing Co., 3800 Cuyler Ave., Chicago, Ill.  
 DoAll Co., Des Plaines, Ill.  
 Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.  
 Van Keuren Co., Watertown 72, Mass.

**PACKING, Leather, Metal, Rubber, Asbestos, Etc.**

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.  
 Watson-Stillman Co., Roselle, N. J.

**PAINTING EQUIPMENT, Spray**—See Spraying Equipment, Metal**PARALLELS**

Brown & Sharpe Mfg. Co., Providence, R. I.  
 DoAll Co., Des Plaines, Ill.  
 G & L and Hydro Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
 Lufkin Rule Co., Saginaw, Mich.  
 Starrett, The L. S., Co., Athol, Mass.  
 Walker, O. S., Co., Inc., Worcester, Mass.

**PATTERNS, Wood and Metal**  
Mummert-Dixon Co., Hanover, Pa.**PIPE, Steel, Stainless, etc.**

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
 Babcock & Wilcox Co. (Tubular Prod. Div.), Beaver Falls, Penna.  
 Bethlehem Steel Co., Bethlehem, Pa.  
 Carpenter Steel Co., 105 W. Bern St., Reading, Pa.  
 Crucible Steel Co. of America, Henry W. Oliver Bldg., Mellon Square, Pittsburgh 22, Pa.  
 Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
 United States Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

**PIPE AND TUBING MILLS, Electric-weld**  
Yoder Co., 5504 Walworth Ave., Cleveland 2, Ohio**PIPE AND TUBING, Brass and Copper**

American Brass Co., 25 Broadway, New York, N. Y.  
 Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.  
 Revere Copper & Brass, Inc., 230 Park Ave., New York 17, N. Y.

**FRICITION SAWING with...****Tanneewitz**  
**HIGH SPEED BAND SAWS****SOLVES THOUSANDS OF PROBLEMS!**

**FOR EXAMPLE:** cutting side panels of a barometric damper as shown above. Cost of dies required for seven sizes would have approximated \$12,000—a prohibitive sum for volume required on these sizes. Friction-sawn on a TANNEWITZ High Speed Band Saw in multiples of two in 1.2 minutes each—a very moderate cost which makes feasible the complete line required. Cost of machine was only a small fraction of cost of dies contemplated and it is also available for many other uses.

For trimming castings, formed parts, cutting metal as hard as a file and dozens of other operations, too, friction sawing with TANNEWITZ High Speed Band Saws offers tremendous advantages. Write for free booklet, "FRICITION SAWING."



**THE TANNEWITZ WORKS • GL 6-1729**  
**GRAND RAPIDS, MICHIGAN**



**TANNEWITZ DIE-SAWS**  
**24", 36", 48", 60" CAPACITIES**  
**for CONTOUR SAWING, FILING, POLISHING**  
*The smoothest, fastest, most trouble-free Die Saws on the market. Write for bulletin.*

**SAWING MACHINERY SPECIALISTS**

# ... Fluid Power

# news

REPORT  
NO. 11,601  
GREATER  
POWER FOR  
EXPANDERS  
SHRINKERS

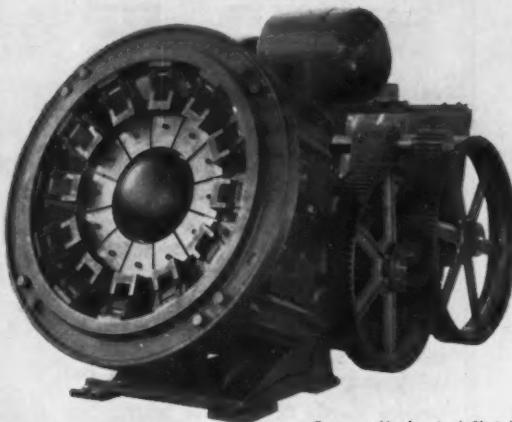
From Oilgear Application-Engineering Files

## HOW OILGEAR HEAVY-DUTY POWER-PAKS EXTENDED WORKING RANGE OF GROTNES MACHINES

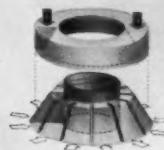
**CUSTOMER:** *The Grotnes Machine Works, Chicago, Illinois.*

**DATA:** Grotnes expanders and shrinkers are used for forming and sizing sheet metal parts and heavy rings to tolerances of  $\pm .002"$  without heat, machining, or waste. Any continuous cross-section part (square, round, oval, etc.) is expanded over jaws mounted in a slotted table. The jaws are moved radially outward by a drawbar-actuated cone, forming or sizing the part by stressing the metal beyond its yield point to induce

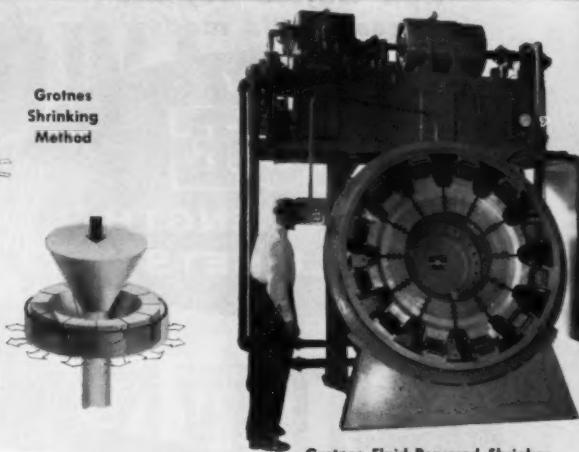
a permanent set. In shrinking, the jaws are forced inward against the part by a tapered ring or toggle links. World-wide acceptance of this unique method has led to industrial requests for Grotnes machines with greater working forces, longer strokes, more uniform power than are practical or possible with mechanical drives using gear trains and crankshafts.



Grotnes Mechanical Shrinker



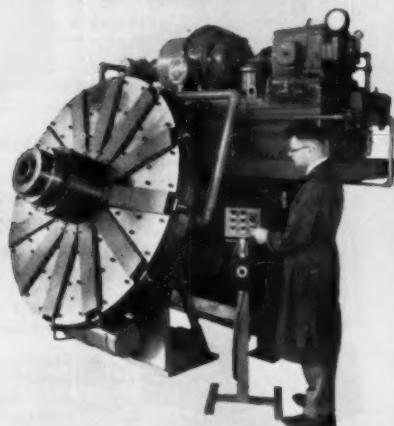
Grotnes  
Expanding  
Method



Grotnes Fluid-Powered Shrinker

**SOLUTION:** Shown above are two Grotnes shrinkers—one mechanically powered, the other Oilgear Fluid Powered for greater tonnage, longer stroke, more uniform power. Note the neat appearance of this new unit with its convenient, simple panel for precise, automatic control. Shown, right, is one of a new line of Grotnes expanders designed specifically for Fluid Power operation. Capacities range up to 1,580 tons on the new expanders; to 800 tons on the new shrinkers—based on 3,000 psi pressure provided by Oilgear application-engineered Heavy-Duty Power-Paks. Performance and control on these new, larger machines has been so outstanding that Grotnes is now equipping expanders as small as 25 tons drawbar pull with Oilgear Power-Paks. This is just one example of Oilgear cooperation and teamwork with designers and builders of machines for industry. An Oilgear Power-Pak is more than just a clean-appearing, unitized assembly of a pump, motor, reservoir, valves and controls . . . it is an efficient, leaktight, easy-to-install, Heavy-Duty Fluid Power system based on over 35 years of pioneering engineering-knowledge that provides: automatic, electric power conservation; precision-controlled pressures, positions, cycle times; dependable operation; unit responsibility for the entire power system. Because of Oilgear's long reputation for dependable, trouble-free Fluid Power for virtually any application, Oilgear has become a name that all industry trusts . . . and uses.

For practical solutions to your linear or rotary drive and control problems, call the factory-trained Oilgear application-engineer in your vicinity. Or write, stating your specific requirements, directly to:



Grotnes Fluid-Powered Expander

Oilgear application-engineered Power-Paks are also used extensively on hotplate, plywood, pulp-baling, injection molding, extruding, forming, and other presses. Oilgear rotary drive and control systems are equally well accepted in virtually every field of manufacturing and processing. For accurately controlled linear or rotary power . . . for the lowest cost per year . . . check with Oilgear!

## THE OILGEAR COMPANY

*Application-Engineered Fluid Power Systems*

1569 WEST PIERCE STREET • MILWAUKEE 4, WISCONSIN

## Product Directory

### **PIPE THREADING AND CUTTING MACHINES**

Davis & Thompson Co., 4460 N. 124th St., Milwaukee 10, Wis.  
Landis Machine Co., Inc., Waynesboro, Pa.  
Sheffield Machine Co., Inc., Waynesboro, Pa.

**PLANER JACKS**—See Set-up Equipment

### **PLANERS, Double Housing and Open-side**

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio  
Consolidated Mach. Tool Div., Rochester, N. Y.  
G & L and Hypro Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
Gray, G. A., Co., 3611 Woodburn Ave., Cincinnati, Ohio  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

Sewald Inc., 1956 Woodbridge Ave., New Brunswick, N. J.

### **PLASTICS AND PLASTIC PRODUCTS**

Dow Chemical Co., Midland, Mich.  
Eastman Kodak Co., 343 State St., Rochester 4, N. Y.  
Gisholt Mch. Co., Madison, Wis.  
U. S. Steel Corp., Nat'l Tube Div., Pittsburgh, Pa.

### **PRESS BRAKES**—See Brakes, Presses and Bending

### **PRESS FEEDERS, Automatic**

Biss Co., E. W., Canton, Ohio  
Federal Press Co., 511 Division St., Elkhart, Ind.  
Nilson, A. H. Machine Co., Bridgeport, Conn.  
Producto Machine Co., 985 Housatonic Ave., Bridgeport 1, Conn.  
U. S. Tool Co., East Orange, N. J.

### **PRESSES, Arbor**

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
du Mont Corp., Greenfield, Mass.  
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
Famco Machine Co., Kenosha, Wis.  
Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.  
Logansport Machine Co., Inc., Logansport, Ind.  
Threadwell Tap & Die Corp., 16 Arch St., Greenfield, Mass.  
Watson-Stillman Co., Roselle, N. J.  
Wilson, K. R., Inc., Arcade, N. Y.

### **PRESSES, Assembling**

Alva Allen Industries, Clinton, Mo.  
Bliss, E. W. Co., 1375 Raff Rd. S. W., Canton, Ohio  
Colonial Broach & Machine Co., Box 37, Detroit 13, Mich.  
Detroit Broach Co., Inc., 950 S. Rochester Rd., Rochester, Mich.  
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
Federal Press Co., 511 Division St., Elkhart, Ind.  
Ferracutte Machine Co., Bridgeton, N. J.  
Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.

### **PRESSES, Blanking, Stamping**

Alva Allen Industries, Clinton, Mo.  
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.  
Bath, Cyril Co., 32324 Solon Rd., Solon, Ohio  
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
Bliss, E. W. Co., 1375 Raff Rd. S. W., Canton, Ohio  
Chambersburg Engineering Co., Chambersburg, Pa.  
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
Cleveland Crane & Engineering Co., Wickliffe, Ohio  
Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio  
Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio  
Federal Press Co., 511 Division St., Elkhart Ind.  
Ferracutte Machine Co., Bridgeton, N. J.  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind.  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
Lodge & Shipley Co., 3055 Colrain Ave., Cincinnati 25, Ohio  
Minster Machine Co., Minster, Ohio  
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
U. S. Tool Co., Inc., 255 N. 18th St., East Orange, N. J.  
V & O Press Co., Hudson, New York  
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
Wilson, K. R., Inc., Arcade, N. Y.

### **PRESSES, Briquetting**

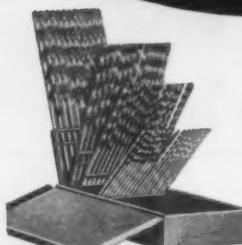
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
Wilson, K. R., Inc., Arcade, N. Y.

### **PRESSES, Closed-Die Forging**

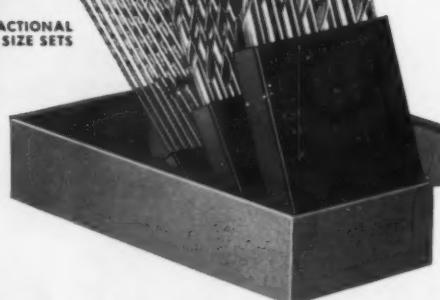
Ajax Manufacturing Co., 1441 Chardon Rd., Cleveland 17, Ohio  
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
Bliss, E. W. Co., 1375 Raff Rd. S. W., Canton, Ohio  
Chambersburg Engineering Co., Chambersburg, Pa.  
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
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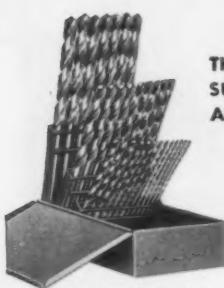
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 Chambersburg Engineering Co., Chambersburg, Pa.  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio  
 Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
 Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
 Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio  
 Ferracutte Machine Co., Bridgeton, N. J.  
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
 Minster Machine Co., Minster, Ohio  
 Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
 Wilson, K. R., Inc., Arcade, N. Y.

Nilson, A. H. Machine Co., Bridgeport, Conn.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
 Wilson, K. R., Inc., Arcade, N. Y.

Watson-Stillman Co., Roselle, N. J.  
 Wilson, K. R., Inc., Arcade, N. Y.

**PRESSES, Foot**

Famco Machine Co., Kenosha, Wis.  
 Ferracutte Machine Co., Briarcliff, N. J.  
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
 Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
 Productive Machine Co., 985 Housatonic Ave., Bridgeport 1, Conn.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
 Wilson, K. R., Inc., Arcade, N. Y.

**PRESSES, Extrusion**

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
 Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
 Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
 Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio  
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.

**PRESSES, Horning**

Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.

(Continued on page 360)

**PRESSES, Die Sinking (Hobbing)**

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
 Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
 Chambersburg Engineering Co., Chambersburg, Pa.  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
 Wilson, K. R., Inc., Arcade, N. Y.

**PRESSES, Die Tryout**

Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio  
 Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
 Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio  
 Federal Press Co., 511 Division St., Elkhart, Ind.  
 Ferracutte Machine Co., Bridgeton, N. J.  
 Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.  
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
 L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind.  
 Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
 Minster Machine Co., Minster, Ohio  
 Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
 Productive Machine Co., 985 Housatonic Ave., Bridgeport 1, Conn.  
 Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
 Wilson, K. R., Inc., Arcade, N. Y.

**PRESSES, Drawing**

Alva Allen Industries, Clinton, Mo.  
 Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.  
 Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
 Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
 Cincinnati Milling & Grinding Machines, Inc., 4710 Marburg Ave., Cincinnati 9, Ohio  
 Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
 Cleveland Crane & Engineering Co., Wickliffe, Ohio  
 Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio  
 Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
 Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
 Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio  
 Ferracutte Machine Co., Bridgeton, N. J.  
 Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
 L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind.  
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 Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.

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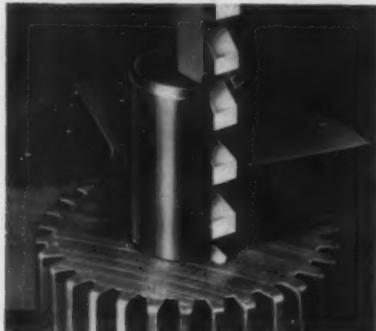
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Ferracutte Machine Co., Bridgeton, N. J.  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
Minster Machine Co., Minster, Ohio  
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
V & O Press Co., Hudson, New York  
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
Wilson, K. R., Inc., Arcade, N. Y.

### PRESSES, Notching

Alva Allen Industries, Clinton, Mo.  
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
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Ferracutte Machine Co., Bridgeton, N. J.  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
Minster Machine Co., Minster, Ohio  
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
V & O Press Co., Hudson, New York  
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
Wales-Strippit Corp., Akron, N. Y.  
Wilson, K. R., Inc., Arcade, N. Y.

### PRESSES, Punching, Piercing

Alva Allen Industries, Clinton, Mo.  
Bath Cyril Co., 32324 Aurora Rd., Solon, Ohio  
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
Cleveland Crane & Engineering Co., Wickliffe, Ohio  
Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio  
Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
Dreis & Krump Mfg. Co., 7400 S. Loomis Blvd., Chicago 36, Ill.  
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
Famco Machine Co., Kenosha, Wis.  
Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio  
Federal Press Co., 511 Division St., Elkhart, Ind.  
Ferracutte Machine Co., Bridgeton, N. J.  
Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.  
L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind.  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
Minster Machine Co., Minster, Ohio  
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
Nissen, A. H. Machine Co., Bridgeport, Conn.  
Verson Allsteel Press Co., 9309 S. Kenwood, Chicago 19, Ill.  
Wales-Strippit Co., Akron, N. Y.  
Wiedemann Machine Co., 4272 Wissahickon Ave., Philadelphia 32, Pa.  
Wilson, K. R., Inc., Arcade, N. Y.

### PRESSES, Quenching

Gleason Wks., 1000 University Ave., Rochester 3, N. Y.  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.

### PRESSES, Rubber-Forming

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.  
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
Chamberburg Engineering Co., Chambersburg, Pa.  
Cincinnati Milling & Grinding Machines, Inc., 4701 Marburg Ave., Cincinnati 9, Ohio  
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
Elmes Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
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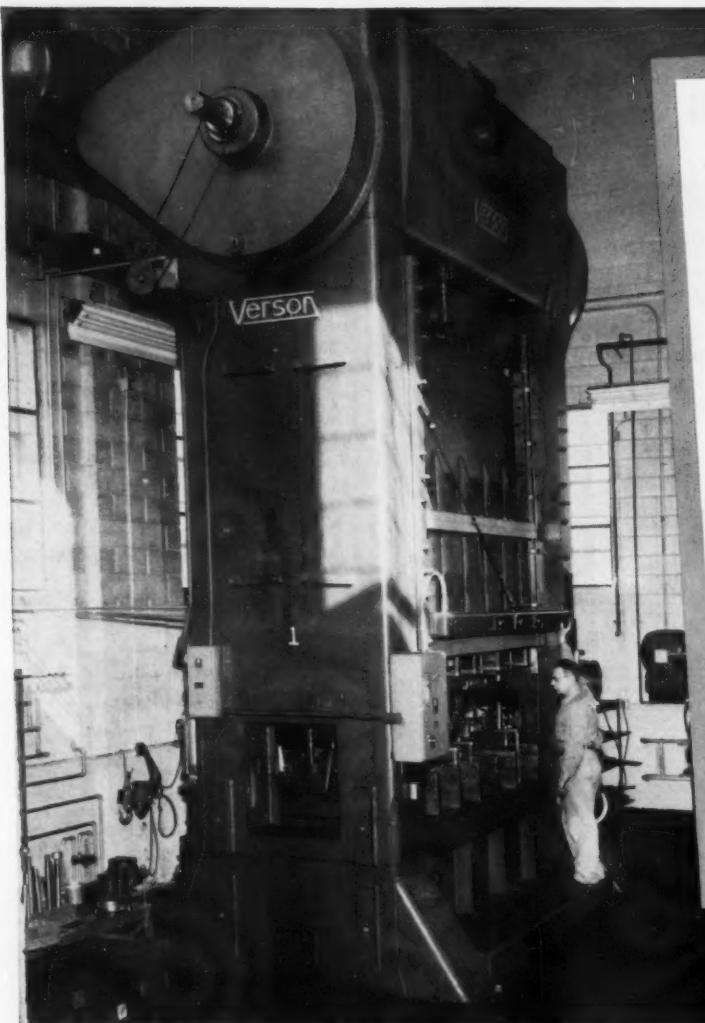


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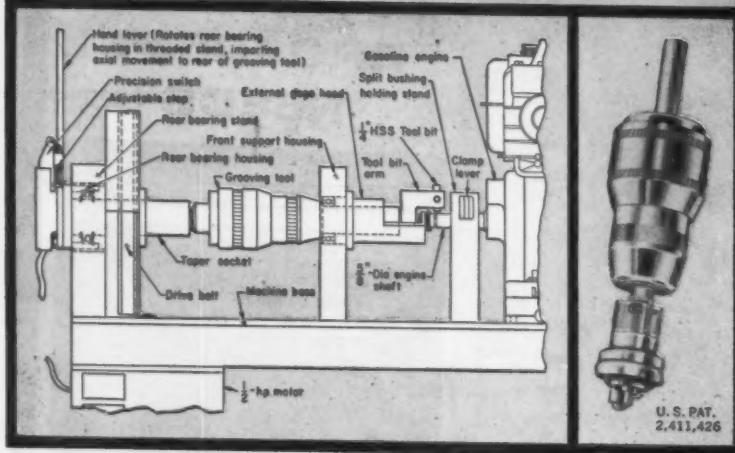
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MACHINERY, September, 1957—361

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Chambersburg Engineering Co., Chambersburg, Pa.  
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.  
Cleveland Punch & Shear Wks. Co., 3917 St. Clair Ave., Cleveland 14, Ohio  
Danly Machine Specialties, Inc., 2100 S. Laramie, Chicago 50, Ill.  
Elmer Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
Federal Machine & Welder Co., 1745 Overland Ave., N. E., Warren, Ohio  
Federal Press Co., 511 Division St., Elkhart, Ind.  
Ferracuti Machine Co., Bridgeton, N. J.  
Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
L & J Press Corp., 1631 Sterling Ave., Elkhart, Ind.  
Lake Erie Machinery Corp., 470 Woodward Ave., Buffalo 17, N. Y.  
Minster Machine Co., Minster, Ohio  
Niagara Machine & Tool Wks., 637 Northland Ave., Buffalo 11, N. Y.  
Verson Allsteel Press Co., 9309 S. Kenwood Ave., Chicago 19, Ill.  
Wilson, K. R., Inc., Arcade, N. Y.

## PROFILING MACHINES—See Milling Machine, Die Sinking, etc.

## PULLEYS

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Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.

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Brown & Sharpe Mfg. Co., Providence, R. I.  
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Grayman Co., 3705 N. Lincoln Ave., Evanston, Ill.  
Ingersoll-Rand Co., Phillipsburg, N. J.  
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.  
Rutherford Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio  
Viking Pump Co., Cedar Falls, Iowa

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Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio  
Elmer Eng. Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio  
Hydraulic Press Mfg. Div., Mount Gilead, Ohio  
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.  
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.  
Vickers Incorporated, Division of Sperry Rand Corp., 402 Oakman Blvd., Detroit, Mich.  
Viking Pump Co., Cedar Falls, Iowa  
Watson-Stillman Co., Roselle, N. J.  
Wilson, K. R., Arcade, N. Y.

## PUNCHES AND DIES—See Dies, Blanketing, etc.

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Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill.  
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DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Heller Tool Co., Heller Dr., Newcomerstown, Ohio  
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.  
Tomkins-Johnson Co., 617 N. Mechanic St., Jackson, Mich.  
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

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Grant Mfg. & Mch. Co., 90 Silliman Ave., Bridgeport 5, Conn.  
Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.  
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.  
Tomkins-Johnson Co., 617 N. Mechanic St., Jackson, Mich.

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Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
Hannifin Corp., 510 S. Wolf Rd., Des Plaines, Ill.  
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

**RULES, SCALES AND STRAIGHTEDGES**  
—See Machinists' Small Tools**RUST INHIBITORS**

Oakite Products, Inc., 19 Rector St., New York N. Y.  
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Shell Oil Co., 501 W. 50th St., New York, N. Y.  
Stuart, D. A. Oil Co., Ltd., 2727 S. Troy St., Chicago 23, Ill.  
Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa.

**SAND BLAST EQUIPMENT**—See Blast Cleaning Equipment**SAW BLADES, Hack, Band, Circular, Friction**

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.  
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Espin-Lucas Mch. Works, Philadelphia, Pa.  
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.  
Starrett, The L. S. Co., Athol, Mass.  
Tannevitz Works, Grand Rapids, Mich.

**SAW BLADE SHARPENERS**

DoAll Co., Des Plaines, Ill.  
Espin-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.  
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

**SAWING MACHINES, Abrasive Machines**—See Cutting-off Saws, Abrasive Wheel**SAWING MACHINES, Band**

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.  
Delta Power Tool Div., Rockwell Mfg. Co., Pittsburgh, Pa.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Farnco Machine Co., Kenosha, Wis.  
Tannevitz Works, Grand Rapids, Mich.

**SAWING MACHINES, Circular Blade**

Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.  
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.  
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.  
Espin-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.

**SAWING MACHINES, Power Hack**

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.  
Chicago Pneumatic Tool Co., New York 17, N. Y.  
Homestrand, Inc., Larchmont, N. Y.  
Racine Hydraulics & Machinery Inc., Racine, Wis.  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.

**SAWS, Screw-slitting**—See Cutters, Milling**SCALES**

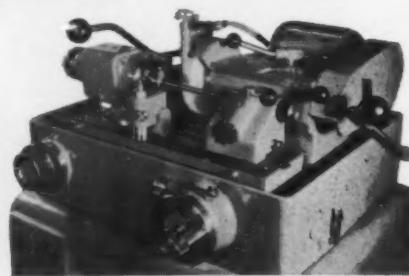
Haydway Scales, Inc., 31302 Stephenson Hwy., Madison Hts., Mich.

**SCREW DRIVERS, STUD AND NUT SETTERS, Power**

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.  
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.  
Cross Co., 3250 Bellevue, Detroit 7, Mich.  
Erlington Mech. Lab. Inc., 24 Norwood Ave., Staten Island 4, N. Y.  
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
Scully-Jones & Co., 1906 S. Rockwell St., Chicago 8, Ill.  
Thor Power Tool Co., Prudential Plaza, Chicago 1, Ill.  
Williams & Co., J. H., 400 Vulcan St., Buffalo 7, N. Y.

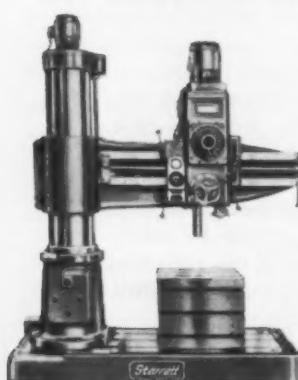
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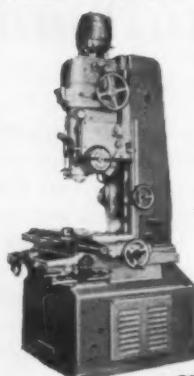
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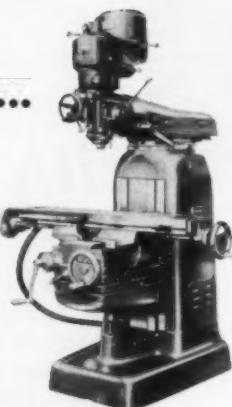
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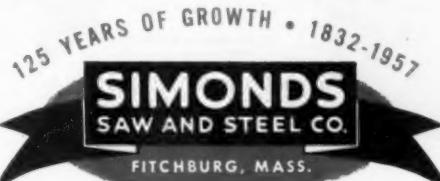
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**SCREW MACHINES, Hand**—See Lathes, Turret, Ram-type, Saddle-type

**SCREW MACHINES, Single-Spindle Automatic**

Aaron Machinery Co., Inc., 45 Crosby St., New York 12, N. Y.  
Brown & Sharpe Mfg. Co., Providence, R. I.  
Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio  
Cone Automatic Mch. Co., Inc., Windsor, Vt.  
Cone Corp., 405 Lexington Ave., New York 17, N. Y.  
Gear Grinding Mch. Co., 3901 Christopher St., Detroit 11, Mich.  
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.  
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.

National Acme Co., 170 E. 131st St., Cleveland, Ohio  
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.  
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., N. Y. 17, N. Y.

**SCREW MACHINES, Multiple-Spindle Automatic**

Cone Automatic Mch. Co., Inc., Windsor, Vt.  
Cone Corp., 405 Lexington Ave., New York 17, N. Y.  
Greenlee Bros. & Co., 2136 12th St., Rockford, Ill.  
National Acme Co., 170 E. 131st St., Cleveland, Ohio  
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.  
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.  
Warner & Swasey, 6701 Carnegie Ave., Cleveland 3, Ohio

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Greenfield Tap & Die Corp., Greenfield, Mass.

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Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.  
Gits Bros. Mfg. Co., 1858 S. Kilbourn Ave., Chicago, Illinois

**SEPARATORS, Magnetic**

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.  
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

**SET-UP EQUIPMENT**

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
Challenge Mchry. Co., Grand Haven, Mich.  
Lufkin Rule Co., Saginaw, Mich.  
Starrett, The L. S. Co., Athol, Mass.  
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

**SHAFTS**

Cumberland Steel Co., 101 Williams St., Cumberland, Md.  
Thomson Ind., Inc., Manhasset, N. Y.

**SHAPERS, Crank and Hydraulic**

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.  
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio  
Homestrand, Inc., Larchmont, N. Y.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.  
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.  
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.  
Western Machine Tool Works, Holland, Mich.

**SHAPERS, Vertical and Slotters**

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.  
Bridgeport Mches., Inc., 500 Lindley St., Bridgeport 6, Conn.  
Consolidated Mch. Tool Div., Blossom Road, Rochester 10, N. Y.  
Homestrand, Inc., Larchmont, N. Y.  
Morey Machinery Co., 383 Lafayette St., New York 3, N. Y.  
Orban, Kurt Co., Inc., 42 Exchange Place, Jersey City 2, N. J.  
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

**SHEARS, Alligator**

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
Lodge & Shipley Co., The, Cincinnati 25, Ohio

**SHEARS, Rotary and Squaring**

Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.  
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati 25, Ohio  
Lodge & Shipley Co., The, Cincinnati 25, Ohio  
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
Simonds Saw & Steel Co. (Knives), 470 Main St., Fitchburg, Mass.

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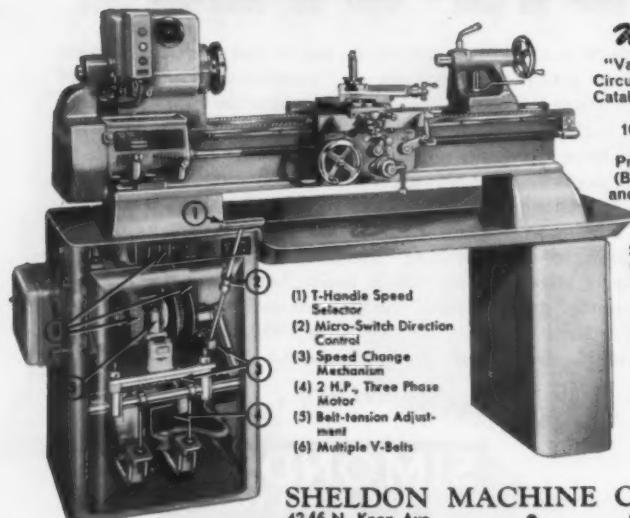
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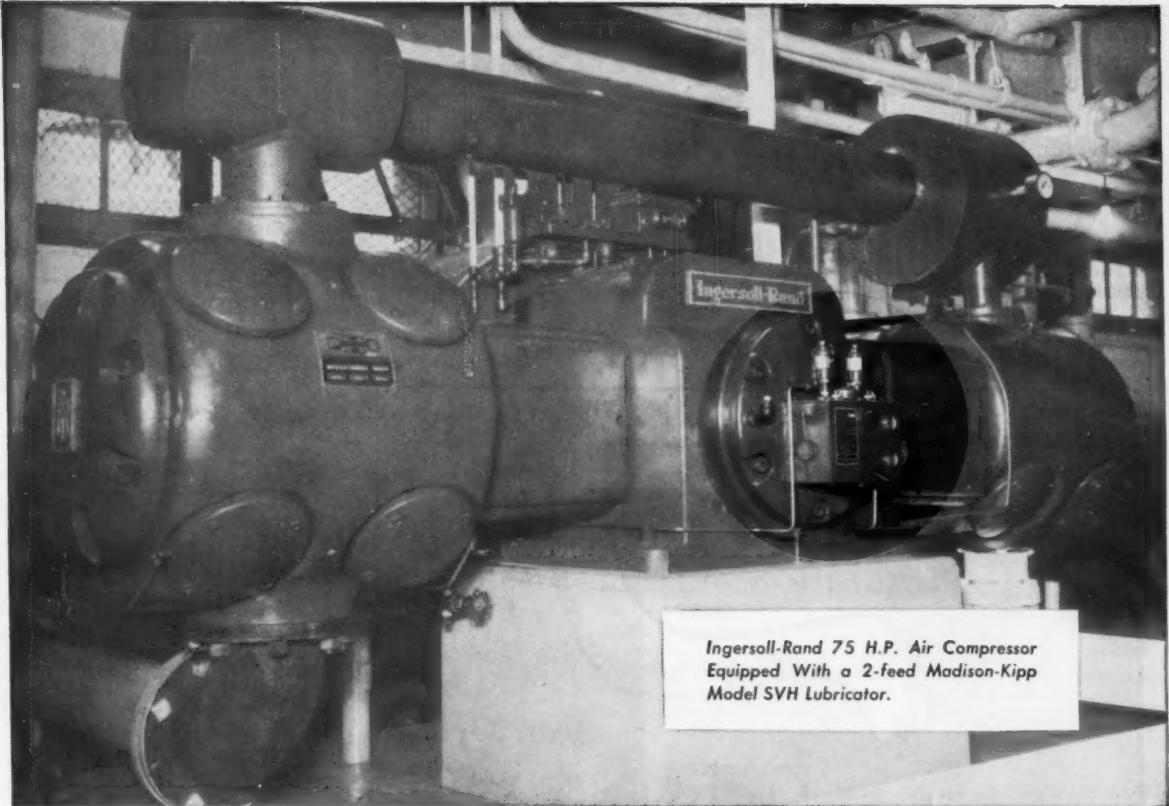
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MACHINERY, September, 1957—367

**SHEET METALS**—See Strip and Sheet, Ferrous, Non-ferrous

#### SHIM STOCK

Laminated Shim Co., Inc., Glenbrook, Conn.  
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

**SHOP FURNITURE**—See Furniture, Shop

#### SLUTTING MACHINES, ROTARY

Bliss Co., E. W., Canton, Ohio  
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo 11, N. Y.  
Yoder Co., 5504 Walworth Ave., Cleveland 2, Ohio

**SLOTTERS**—See Shapers, Vertical and Slotters

**SOCKETS**—See Drill Sleeves and Extension Holders

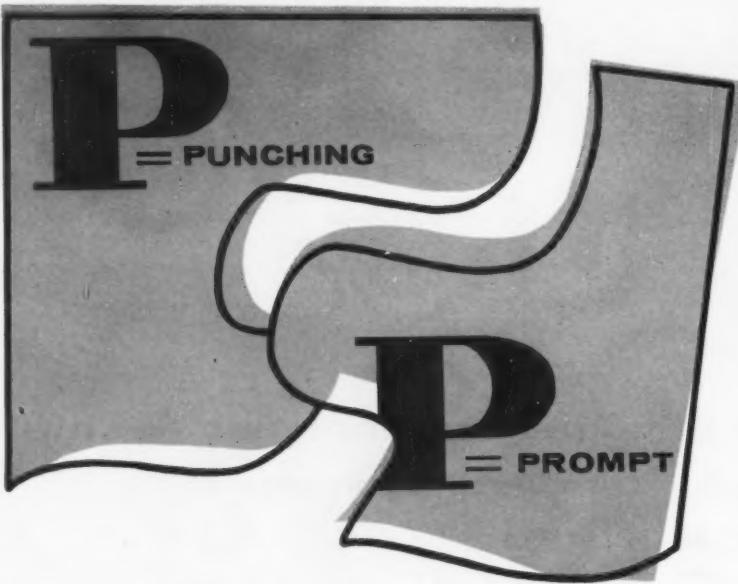
#### SOLENOIDS

Allen-Bradley Co., 1331 S. 1st St., Milwaukee 4, Wis.  
Barnes, John S. Corp., Rockford, Ill.  
General Electric Co., Schenectady, N. Y.  
National Acme Co., 170 E. 131st St., Cleveland 3, Ohio  
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Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.  
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.  
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio  
Baker Bros., Inc., Sta. F., P.O. Box 101, Toledo 10, Ohio  
Bath, Cyril Co., Aurora & Solon Road, Solon, Ohio  
Barney Drill Co., 814 Chestnut, Rockford, Ill.  
Barnes, W. F. & John Co., 201 S. Water St., Rockford, Ill.  
Bauan Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.  
Bethlehem Steel Co., Bethlehem, Pa.  
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.  
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.  
Blanchard Mch. Co., 64 State St., Cambridge, Mass.  
Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Ohio  
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.  
Chambersburg Engrg. Co., Chambersburg, Pa.  
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio  
Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.  
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio  
Consolidated Mch. Tool Corp., Rochester, N. C.  
Coulter, James, Machine Co., Bridgeport 5, Conn.  
Cross Co., Detroit, Mich.  
Erie Foundry Co., Erie, Pa.  
Espin-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.  
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.  
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.  
Federal Machine & Welder Co., Overland Ave., Warren, Ohio  
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.  
Gisalit Machine Co., 1245 E. Washington Ave., Madison 10, Wis.  
Gorton, Geo. Mch. Co., 1110 W. 13th St., Racine, Wis.  
Greene Bros., & Co., 12th and Columbia Aves., Rockford, Ill.  
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill.  
Hartford Special Mchry. Co., 287 Homestead Ave., Hartford, Conn.  
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
Hydraulic Press Mfg. Co., Mount Gilead, Ohio  
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.  
Kingsbury Mch. Tool Corp., Keene, N. H.  
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.  
LeMaire Tool & Mfg. Co., Dearborn, Mich.  
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.  
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.  
Moline Tool Co., 102 20th St., Moline, Ill.  
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio  
National Acme Co., 170 E. 131st St., Cleveland, Ohio  
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.  
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.  
National Twist Drill & Tool Co., Rochester, Mich.  
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.  
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.  
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.  
Oligeer Co., 1569 W. Pierce St., Milwaukee, Wis.  
Robbins, Omer E. Co., 24800 Plymouth Rd., Detroit 39, Mich.  
Seneca Falls Mch. Co., Seneca Falls, N. Y.  
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.  
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio  
Sundstrand Mch. & Tool Co., 2531 11th St., Rockford, Ill.  
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(Continued on page 370)



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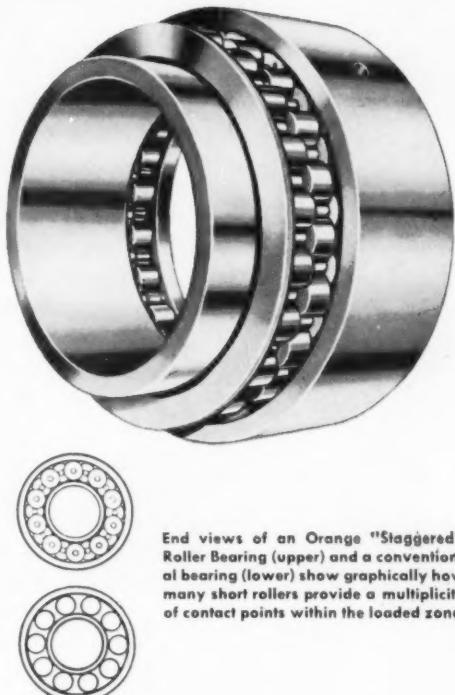
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Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio  
Cone Drive Gear Div., 7171 E. McNichols Rd., Detroit 12, Mich.  
DoAll Co., Des Plaines, Ill.  
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.  
General Electric Co., Schenectady, N.Y.  
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio  
James, D. O., Gear Mfg. Co., 1140 W. Monroe St., Chicago 7, Ill.  
Philadelphia Gear Works, Inc., Erie Ave., and G. St., Philadelphia, Pa.  
Reliance Elec. & Engrg. Co., 1200 Ivanhoe Rd., Cleveland 10, Ohio

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National Automatic Tool Co., S. 7th-N. St., Richmond, Ind.  
Standard Electrical Tool Co., 2488-90 River Road, Cincinnati, Ohio  
Wadell Equip. Co., Clark, N.J.

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Dayton Rogers Mfg. Co., Minneapolis, Minn.  
Laminated Shim Co., Inc., Glenbrook, Conn.  
Revere Copper & Brass Inc., 230 Park Ave., New York, N.Y.

### STEEL ALLOYS—See Alloy Steels

### STEEL, Cold Rolled, Stainless, High-Speed, Tool, Etc.

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.  
Bethlehem Steel Co., Bethlehem, Pa.  
Carpenter Steel Co., 103 W. Bern St., Reading, Pa.  
Columbia Tool Steel Co., Chicago Hts., Ill.  
Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.  
Cumberland Steel Co., 101 Williams St., Cumberland, Md.  
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.  
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.  
Timken Roller Bearing Co., Canton, Ohio  
U. S. Steel Corp. (American Steel & Wire Co.), Div., 436 7th Ave., Pittsburgh, Pa.  
Vanadium-Alloys Steel Co., Latrobe, Pa.  
Wheeler, Lovejoy & Co., Inc., Cambridge, Mass.

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DoAll Co., Des Plaines, Ill.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
Landis Mch. Co., Waynesboro, Pa.  
Threadwell Tap & Die Co., Greenfield, Mass.

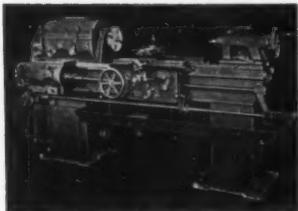
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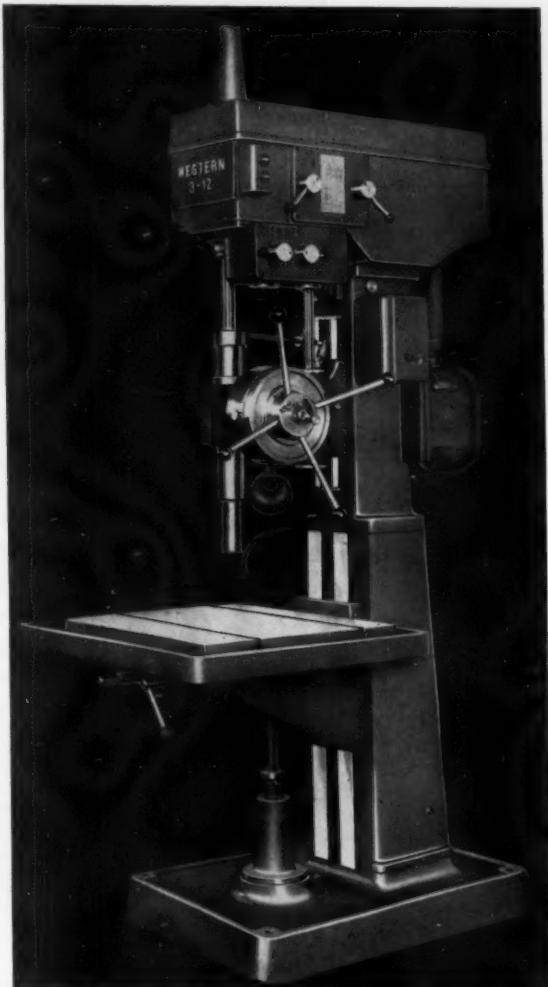
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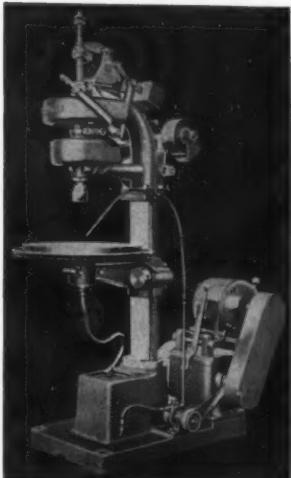
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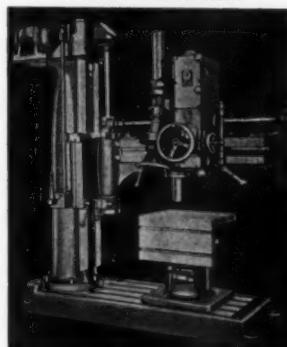


**WESTERN HEAVY-DUTY UPRIGHT DRILLS** contain 18 geared spindle speeds, nine power feeds, an extra large work table and ample power . . . all outstanding features built into this one machine. Available in single- or multiple-spindle models. All transmission shafts are multiple splined, precision ground, and have an alloy steel, involute splined spindle of heavy-duty proportions mounted on three precision ball bearings, with a No. 3 or No. 4 Morse taper nose. Speed and feed selections are made by sliding hardened steel gearing on multiple involute splined shafts. All transmission shafts are mounted on permanently lubricated ball bearings, eliminating supplementary lubrication. All of the gearing is totally enclosed and running in lubricant. Also available in high speed, infinitely variable type, single or multiple spindles. Complete accessory selection.

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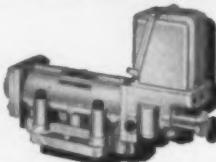
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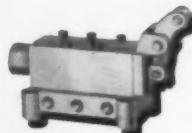
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Ryerson, Jos. T., & Son, Inc., 2558 W. 16th  
St., Chicago 18, Ill.  
U. S. Steel Corp., (American Steel & Wire Co.  
Div., Carnegie-Illinois Steel Corp., Div., Co-  
lumbia Steel Co., Div., Tennessee Coal, Iron  
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DoAll Co., Des Plaines, Ill.  
South Bend Lathe Wks., South Bend 22, Ind.

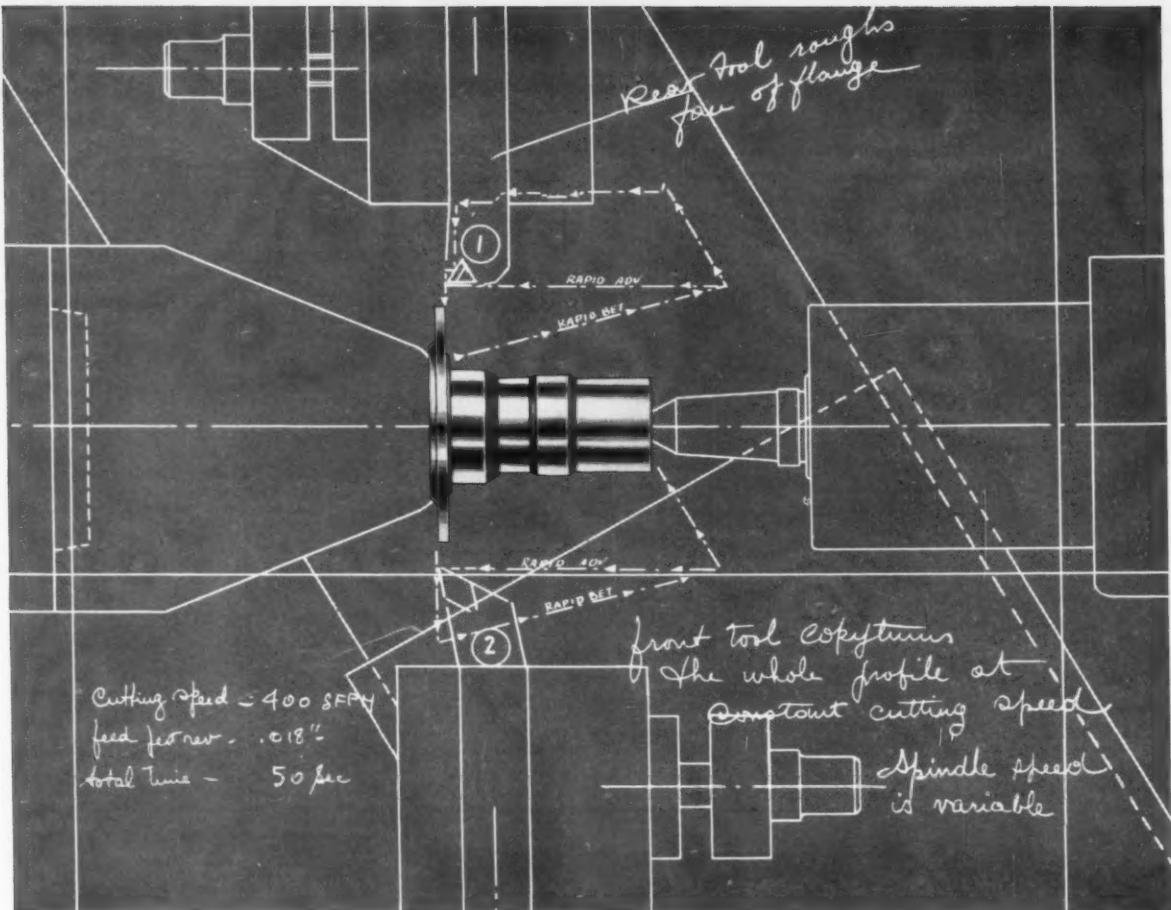
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lyn 37, N. Y.  
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**the Conomatic Pilot copyturns  
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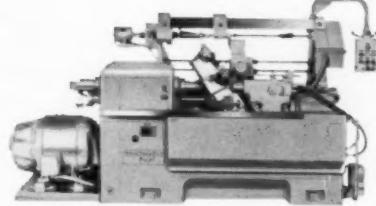
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PILOT DIVISION

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 Errington Mechanical Laboratory, 24 Norwood Ave., Staten Island, N. Y.  
 Etco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.  
 Homstrand Inc., Larchmont, N. Y.  
 LaSalle Tool, Inc., 3480 E. Outer Drive, Detroit 34, Mich.  
 Leland-Gifford Co., 1425 Southbridge St., Worcester, Mass.  
 National Automatic Tool Co., S. 7th - N Sts., Richmond, Ind.  
 Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

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 Cincinnati Bickford Div. of Giddings & Lewis Mch. Tool Co., Oakley, Cincinnati 9, Ohio  
 Chicago Pneumatic Tool Co., New York 17, N.Y.  
 Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.  
 Elgin Corp. of Mich., 1830 Stephenson Highway, Royal Oak 3, Mich.  
 Etco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.  
 Govro-Nelson Co., 1831 Antoinette St., Detroit 8, Mich.  
 Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio  
 Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio  
 Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.  
 Kaufman Manufacturing Co., Manitowoc, Wis.  
 Kingsbury Mch. Tool Corp., Keene, N. H.  
 Landis Mch. Co., Waynesboro, Pa.  
 LaSalle Tool Inc., 3840 E. Outer Drive, Detroit 34, Mich.  
 LeMaire Tool & Mfg. Co., Dearborn, Mich.  
 Moline Tool Co., 102 20th St., Moline, Ill.  
 National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.

Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio  
 Western Machine Tool Works, Holland, Mich.

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 Greenfield Tap & Die Corp., Greenfield, Mass.  
 Hanson-Whitney Co., 169 Bartholomew Ave., Hartford 3, Conn.  
 Hy-Pro Tool Co., New Bedford, Mass.  
 Sheffield Corp., 721 Springfield St., Dayton 1, Ohio  
 Threadwell Tap & Die Co., Greenfield, Mass.  
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 Landis Machine Co., Waynesboro, Pa.  
 National Acme Co., 170 E. 131st St., Cleveland 3, Ohio  
 National Machinery Co., Tiffin, Ohio  
 Reed Rolled Thread Die Co., P. O. Box 350 Worcester 1, Mass.  
 Sheffield Corp., Dayton 1, Ohio  
 V & O Press Co., Hudson, New York

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 Scully-Jones Co., 1906 S. Rockwell St., Chicago 8, Ill.

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 Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.  
 Bridgeport Mches., Inc., 500 Lindley St., Bridgeport 6, Conn.  
 Cleveland Automatic Mch. Co., 4932 Beech St., Cincinnati 12, Ohio  
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio  
 Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.  
 Delta Power Tool Div., 400 N. Lexington Ave., Pittsburgh, Pa.  
 Eastern Mch. Screw Corp., Truman & Barclay Sts., New Haven 6, Conn.  
 Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.  
 Lovejoy Tool Co., Inc., Springfield, Vt.  
 Metal Carbides Corp., 6001 Southern Blvd., Youngstown 12, Ohio  
 R & L Tools, 1825 Bristol St., Philadelphia 40, Pa.  
 Scully-Jones & Co., 1903 Rockwell St., Chi-Vascoloy-Ramet Corp., Waukegan, Ill.  
 Walton Co., Hartford 10, Conn.  
 Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.  
 Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

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 Armstrong Bros. Tool Co., 5213 W. Armstrong Ave., Chicago 30, Ill.  
 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio  
 DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.  
 Kennametal, Inc., Latrobe, Pa.  
 Lovejoy Tool Co., Inc., Springfield, Vt.  
 Metal Carbides Corp., Youngstown 12, Ohio  
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 Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio  
 DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.  
 Kennametal, Inc., Latrobe, Pa.  
 Lovejoy Tool Co., Inc., Springfield, Vt.  
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 Valenite Metals Corp., Royal Oak, Mich.  
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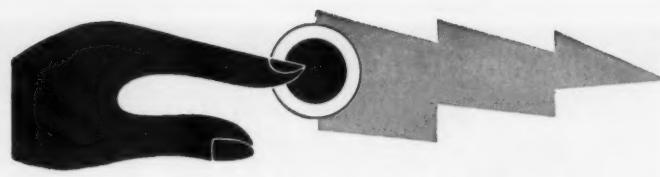
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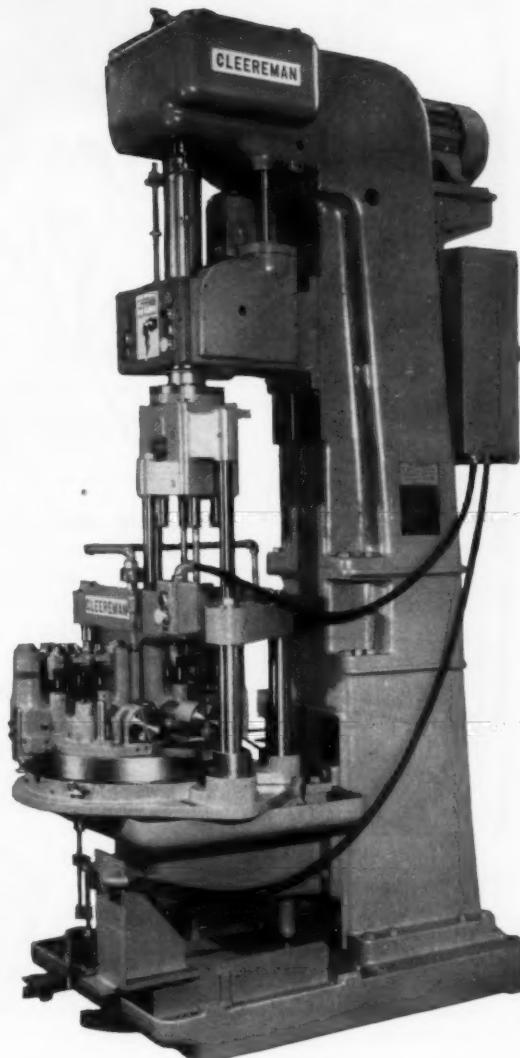
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Carpenter Steel Co., Reading, Pa.  
Cleveland Twist Drill Co., 1242 E. 49th St.,  
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Crucible Steel Co. of America, Oliver Bldg.,  
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### TRANSFER MACHINES, Automatic— See Multiple-Station Machines

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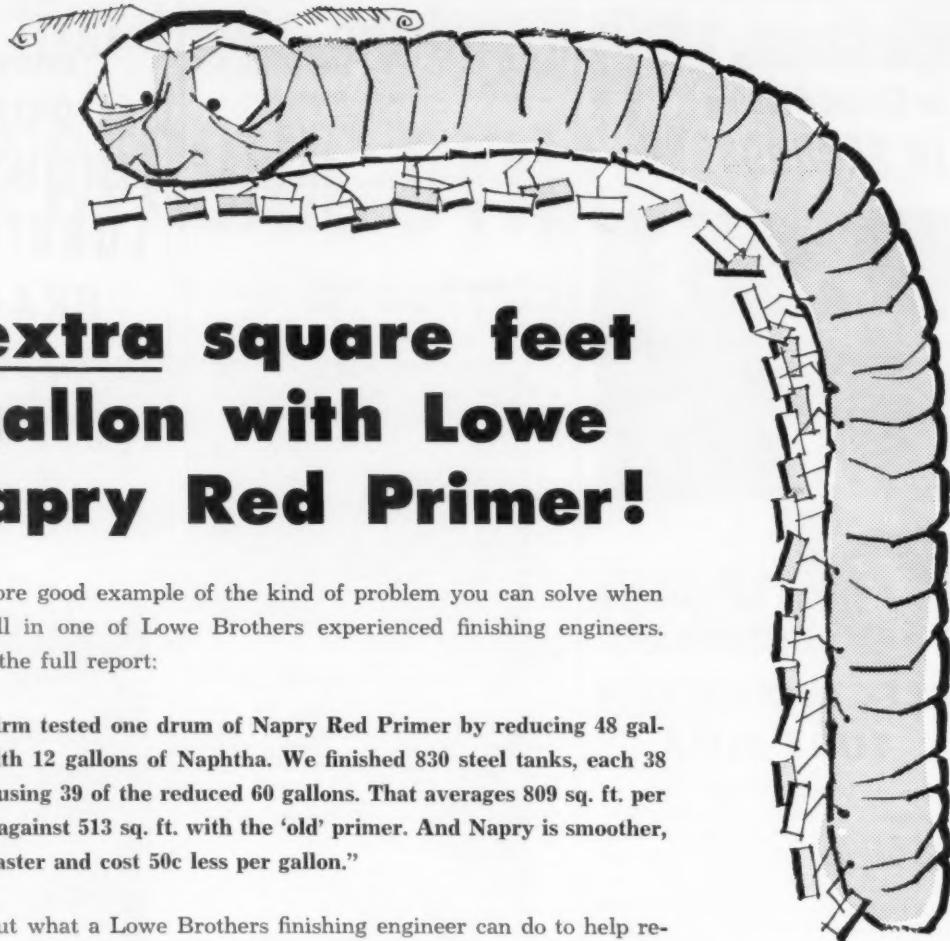
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(Continued on page 378)



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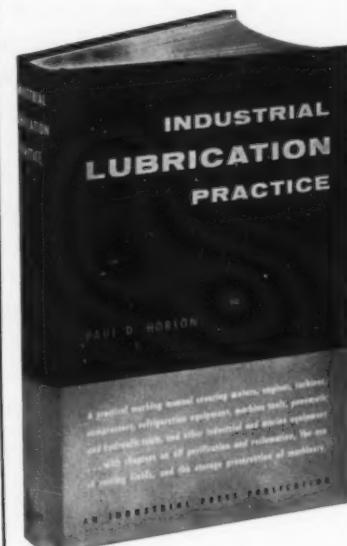
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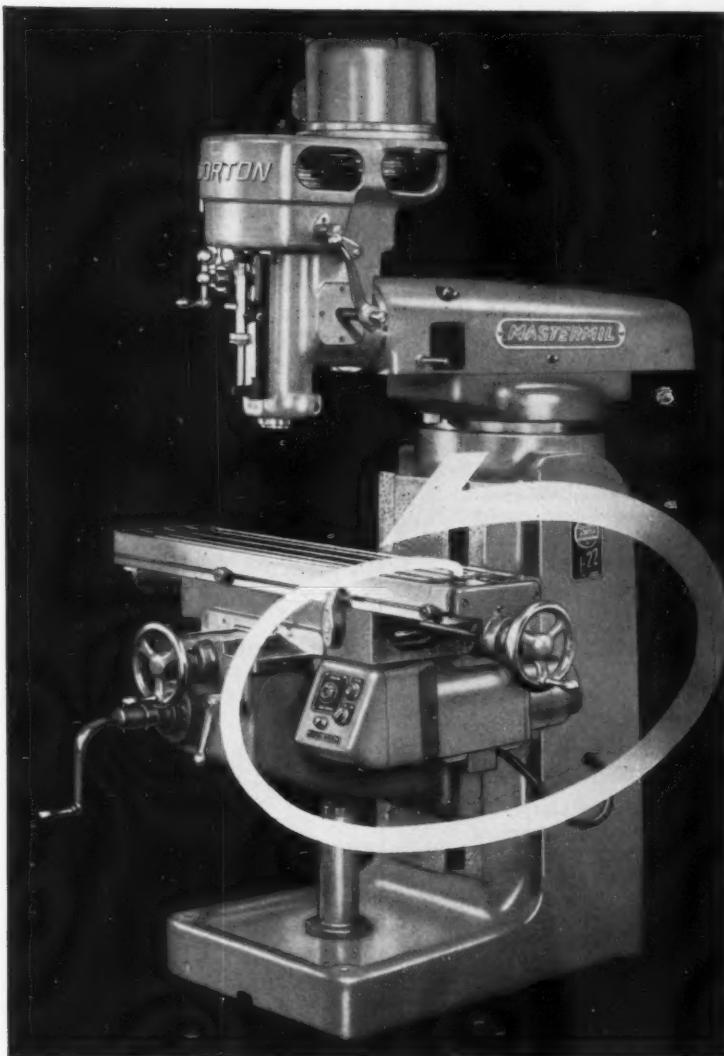
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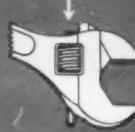
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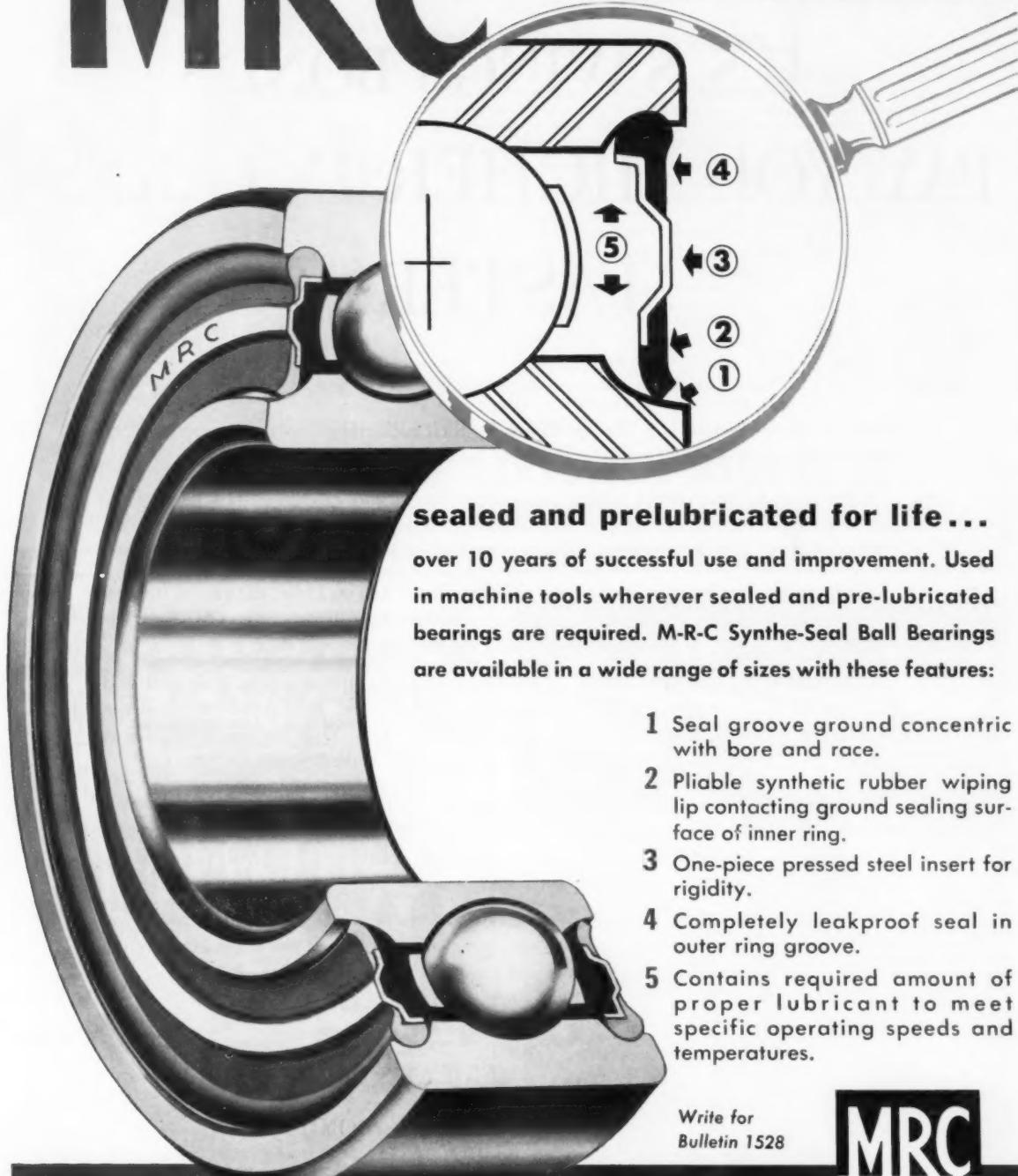
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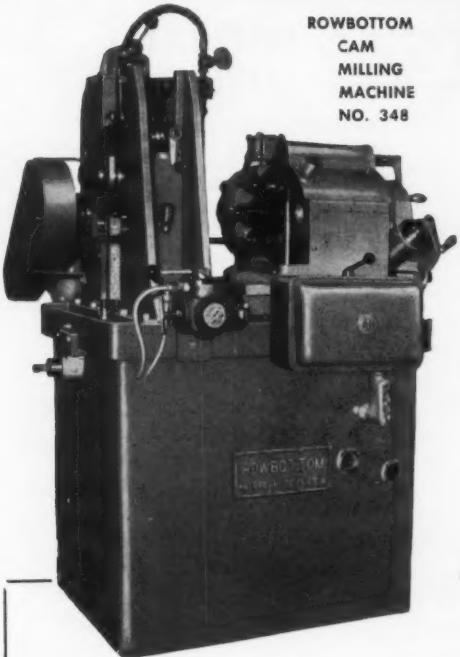
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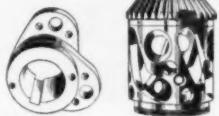
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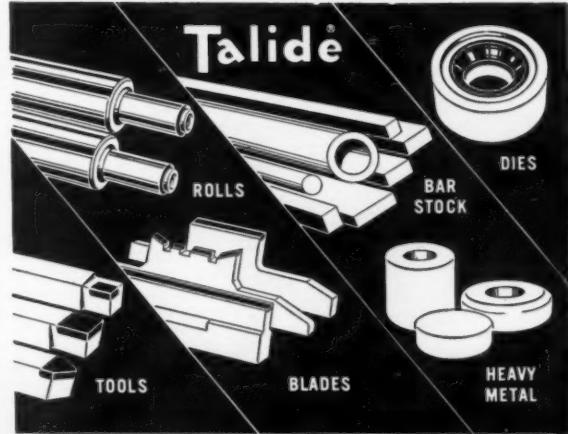
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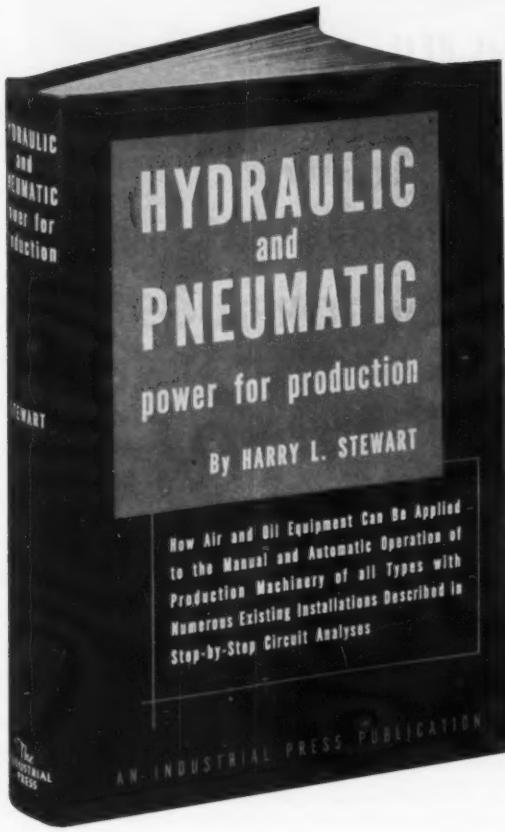
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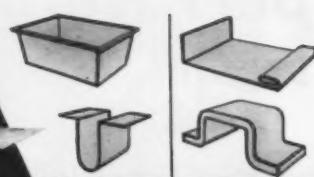
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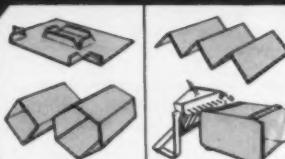
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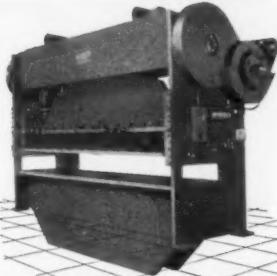
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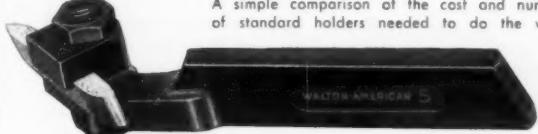
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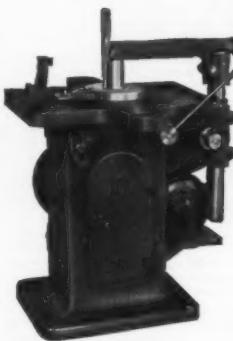
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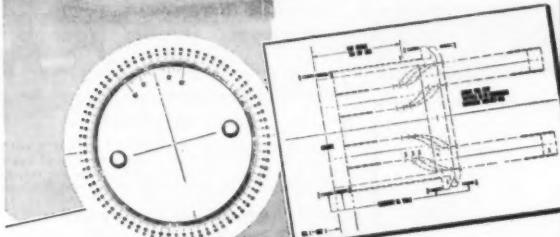
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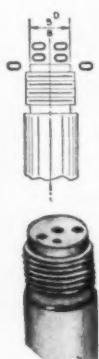
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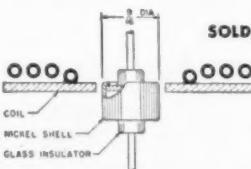


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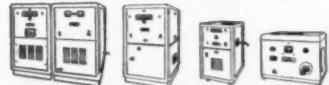


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2 $\frac{1}{2}$ " Cleveland, m.d., Model A  
No. 4D Potter & Johnston, m.d.  
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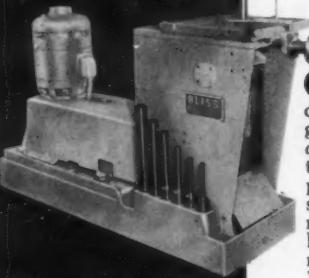
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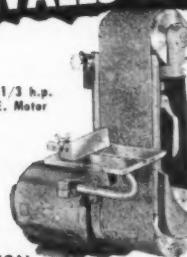
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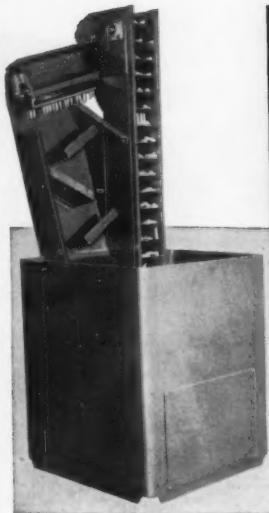
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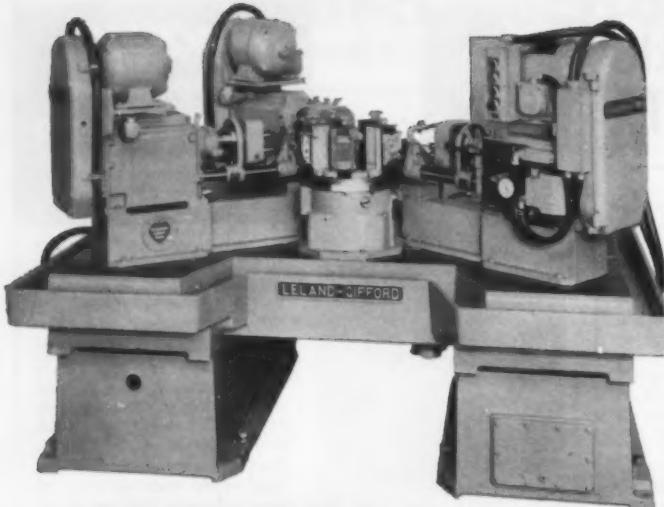
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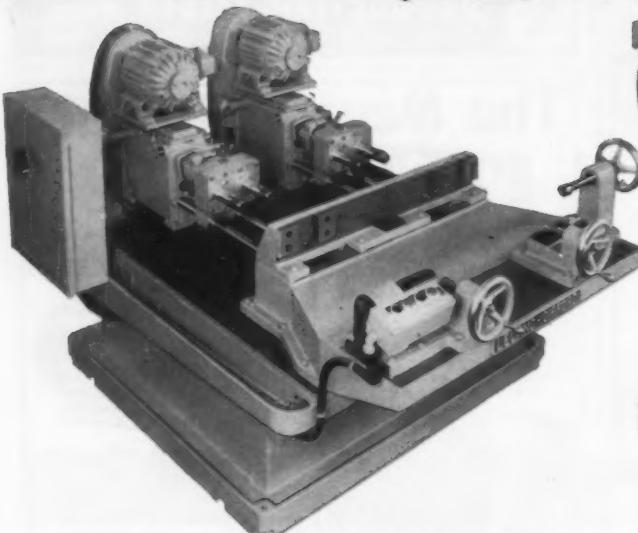
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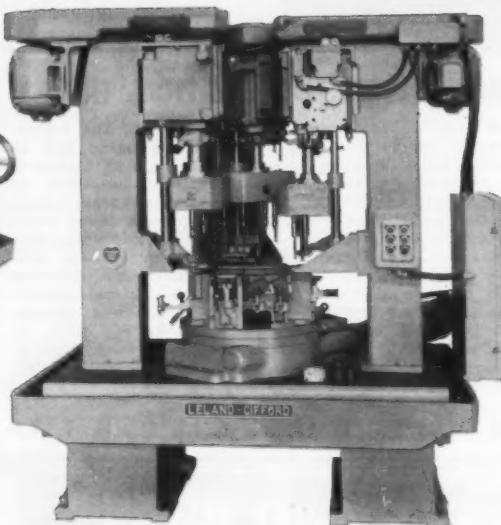
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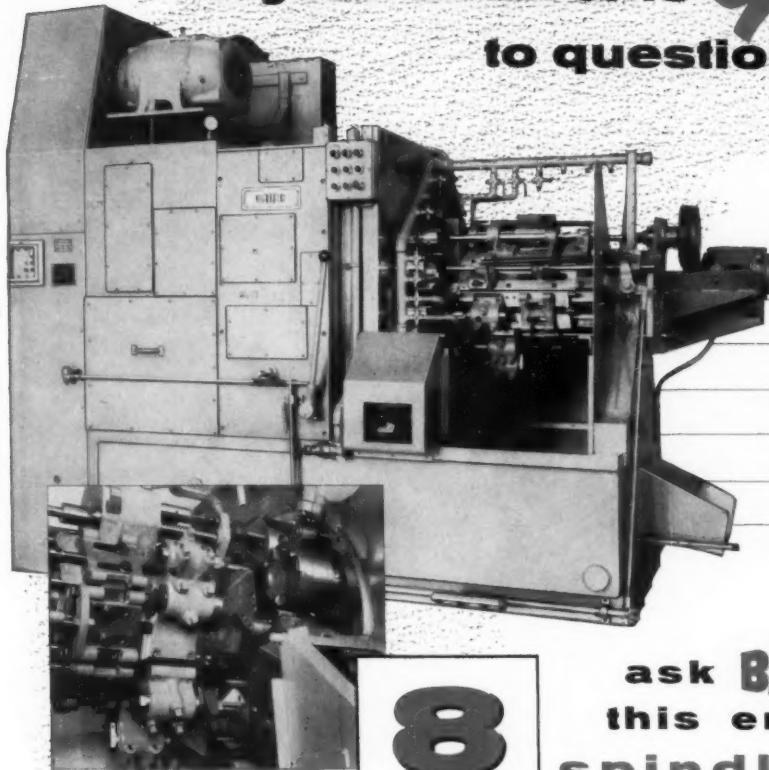
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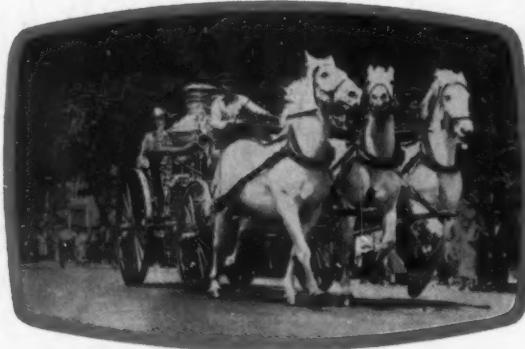
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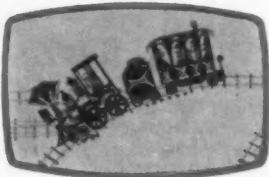
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